ROADS AND STREETS

MAY 1945

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DETROIT

TECHNOLOGY DEPT.

CLEANING UP IN EUROPE

The debris of this most devastating of all wars presents a very real problem as the tide of battle ebbs and flows, engulfing our enemies in its lurid flood.

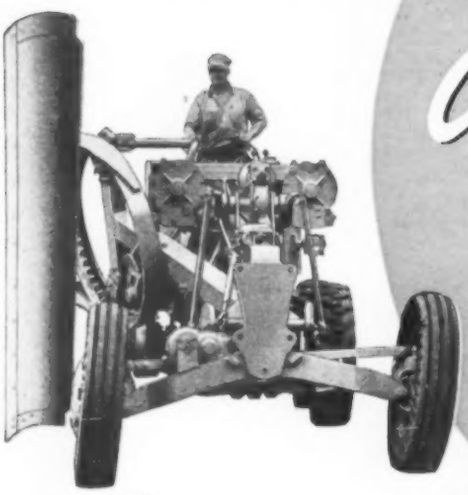
Almost as many Timken Bearing Equipped machines are being used in cleaning up the debris of destruction as in the destruction itself; many more will be needed when the task of reconstruction begins.

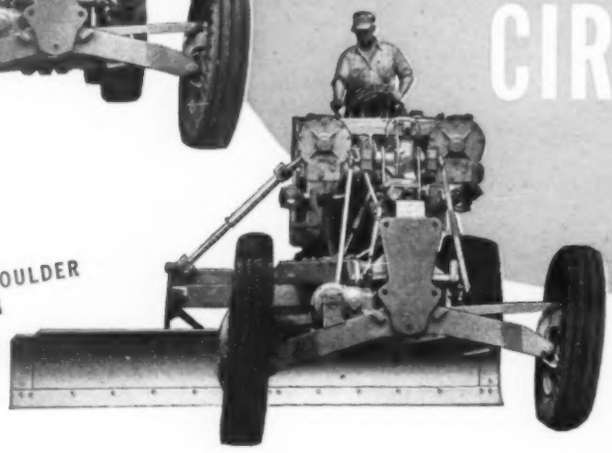
This photograph, taken in France by the U. S. Signal Corps shows a Buckeye Clipper Power Shovel clearing away rubble in a French town in the path of the advancing armies of liberty. Buckeye Shovels, like most leading makes, use Timken Bearings for greater efficiency and endurance. So no matter what kind of construction equipment you build or buy, make sure you have Timken Bearings in it—see that the trade-mark "TIMKEN" is stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio.

Photograph courtesy The Buckeye Traction Ditcher Company, Findlay, Ohio.

TIMKEN
TRADE-MARK REG. U.S. PAT. OFF.
TAPERED ROLLER BEARINGS

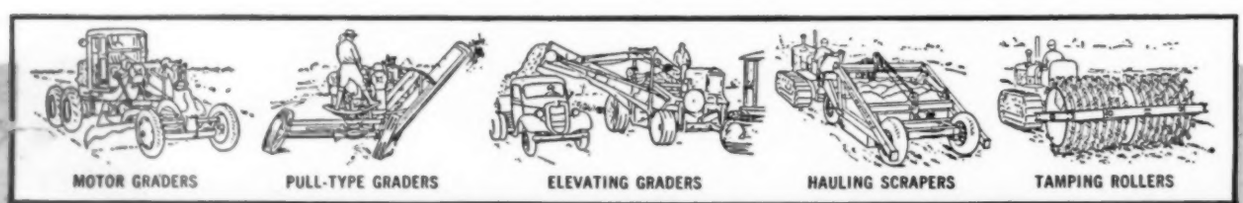
ADAMS MOTOR GRADERS PROVIDE *All of these Positions...* WITH BLADE CENTERED ON CIRCLE





Fast power-operated cab controls accurately position Adams Motor Grader blades for all average surface, ditch and bank work—quickly, efficiently—*without shifting blade on circle or even adjusting the blade lift links!* Occasional cuts calling for unusual blade positions are easily handled through simple adjustment of the telescopic lift links. Only on the most extraordinary work, where extreme blade positions are demanded, is it necessary ever to shift blade on the circle. Thus do advanced Adams design principles assure you of fast, economical operation—*high production at low cost!* A local Adams dealer is near you. Consult him for full information and present availability of Adams Equipment.

J. D. ADAMS MANUFACTURING CO.
INDIANAPOLIS, INDIANA
Sales and Service Throughout the World



ADAMS ☆ ROAD-BUILDING AND ☆ EARTH-MOVING EQUIPMENT

"NO DELAYS ON THIS JOB"

"Yes—the job's moving right along, and we expect to finish ahead of schedule. One reason is we ordered all the steel for the job from one concern—Bethlehem. Everything arrived right on the dot—not a minute's delay while we were held up for material. The time and trouble that saved! We sure are sold on Bethlehem Road Steel Service, after this experience!"

Here's something to think about in planning postwar highway-building:

To keep the job moving fast, contractors can count on Bethlehem to supply all the material, and supply it fast. Bethlehem makes all the steel needed to build a highway, street or any type of bridge. When a contractor buys all the steel for a job from Bethlehem he obtains everything he needs on a single order, with most of the items shipped from one of Bethlehem's handy warehouses. The entire order is carefully co-ordinated, handled as a unit, with shipments scheduled so that he gets each item of steel as he needs it.

It pays—in time, money and trouble saved—to make Bethlehem your headquarters for all the steel products used in building highways, streets, roads and highway bridges.

Bethlehem highway products, listed here, are sturdy and reliable—designed and built for rugged performance. For full information about them, get in touch with the nearest Bethlehem district office, or write direct to Bethlehem Steel Company, Bethlehem, Pa.

Bethlehem Steel for Highways

ROAD JOINTS • DOWELS • DOWEL BAR SUPPORTS • CENTER STRIP • WIRE ROPE AND STRAND • BAR MATS • BAR TIES • ANCHOR RODS • GUARD RAILS • GUARD POSTS AND BRACKETS • PIPE • HOLLOW DRILL STEEL • DIGGING BARS • STRUCTURAL STEEL • MOLD BOARDS • CONCRETE REINFORCING BARS • BRIDGE FLOOR REINFORCING • CORRUGATED SHEETS • BAR SUPPORTS • TURNBUCKLES • TIE RODS, SPIKES, BOLTS AND NUTS • RIGHT-OF-WAY FENCE AND POSTS • TIMBER BRIDGE HARDWARE • SHEET AND H-BEARING PILING

BETHLEHEM STEEL

THESE PHOTOS SHOW WHY SIGNS REFLECTORIZED WITH

Scotchlite

REFLECTIVE SIGN MATERIAL

Are Now Used Throughout The United States

Signs reflectorized with SCOTCHLITE give greater readability from maximum distances. Brilliance without glare also emphasizes the message for close-up reading. The over-all reflectorization retains the same shape sign and appearance day or night and in addition provides a larger reflectorized area as a warning. The result is a factor-of-safety for the motorist.

Available in roll form, SCOTCHLITE reflective sign material brings the over-all reflectorization of signs down to a price within the highway department's budget.

Lettering can be applied to SCOTCHLITE by screen process, stencil or brush. The ease of lettering plus the four SCOTCHLITE colors of yellow, white, silver and red, make it the most practical and adaptable reflective material for all types of highway signs.

AVAILABLE IN ROLL FORM
MADE AND PATENTED IN U.S.A. BY

3-M

MINNESOTA MINING AND MANUFACTURING CO.
GENERAL OFFICES: SAINT PAUL 6, MINN.
BRANCHES IN PRINCIPAL CITIES

ROADS AND STREETS

Vol. 88, No. 5 May, 1945

CCA

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

HALBERT P. GILLETTE, President; EDWARD S. GILLETTE, Publisher; HAROLD J. McKEEVER, Editor; CHARLES T. MURRAY, Managing Editor; JOHN C. BLACK, Field Editor; LT. COL. V. J. BROWN, Publishing Director (Absent on Military Duty); H. J. CONWAY, Advertising Editor; L. R. VICKERS, Promotional Director.

CONTENTS

Novel Methods Speed Texas Widening 57

1,600,000 Cu. Yds. of Rock 64

Editorial 69

Regulations, Administration of 1944 Highway Act 71

Secondary Roads Need Action Now 79
By Charles M. Upham, Engineer-Director American Road Builders' Association

History That is Not "The Bunk" 81
By Halbert P. Gillette

Where We Are in Airport Design 82
By Harold J. McKeever, Editor, Roads and Streets

Thick Runway Slabs Internally Vibrated 88

To China—By Land 89
By Brig. General T. F. Farrell, Corps of Engrs., Construction Service, SOS, India-Burma Theatre

How Arc Welding Saved Old Bridge 92
By C. M. Neeld, President, Neeld Construction Co., Pittsburgh, Pa.

Problems of the Postwar Contractor 94
By J. Rutledge Hill, Gifford-Hill & Co., Inc., Dallas, Tex.

165 Miles of Igloo Access Road 95

Construction Equipment Maintenance: Hard Face It! 97
By M. L. Eder, Mgr., Technical Advisory Service Staff, Coast Metals, Inc., Canton, Ohio

Texas Contractor Shop Has Modern Layout 100

New Equipment and Materials 110

Obituaries 118

With the Manufacturers and Distributors 118

Clearing House 126

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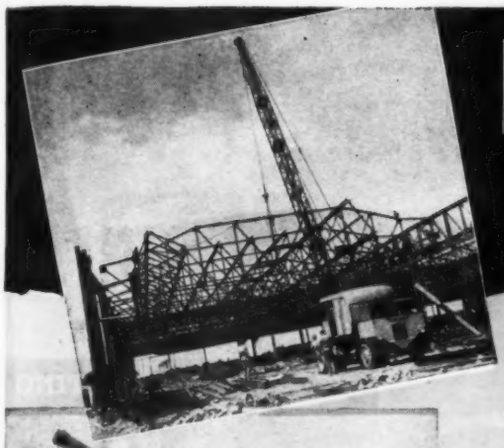
MOBIL-IZE FOR SPEED!

Put Your Jobs On Wheels With Lorain Rubber-Tired Shovels and Cranes



Moto-Crane erecting steel.

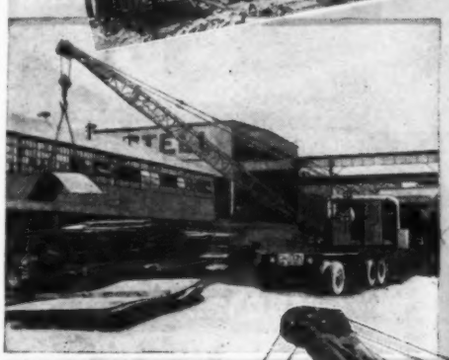
IN a fast moving postwar world, *speed* will be the key to greater construction profits—speed on the job—speed to cut time lost moving between jobs—and speed in converting equipment from one kind of work to another. Lorain rubber-tired shovels and cranes will help you get there fast—do it fast—and change to the next job fast!

TWO TYPES OF RUBBER-TIRED MACHINES

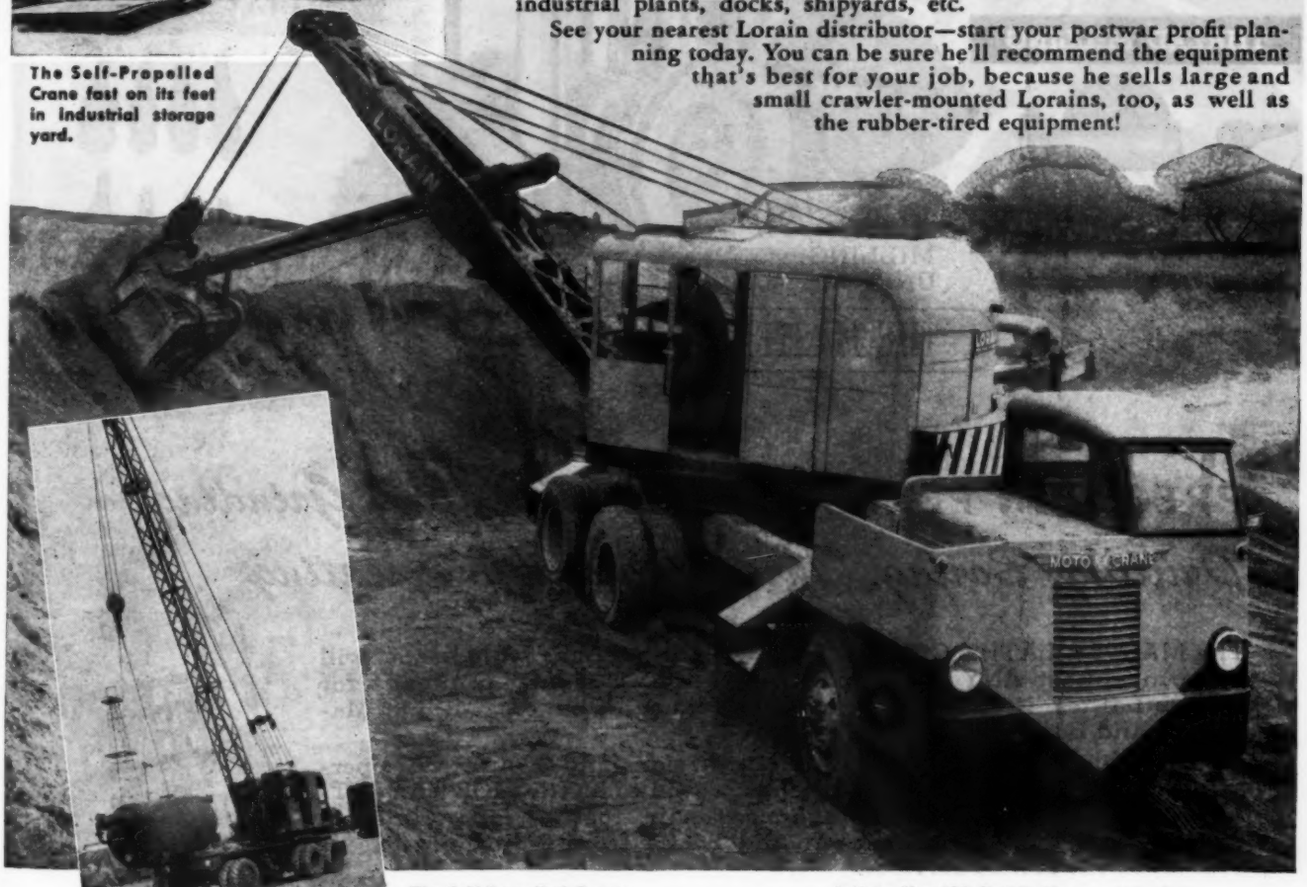
Moto-Cranes and Shovels feature 30 MPH speed between jobs, 15 and 20 ton capacities and high on-the-job efficiency. They are available in both 4 x 6 and 6 x 6 (front-wheel drive) models.

The Lorain rubber-tired Self-Propelled Crane is operated and propelled by a single engine and single operator. This new unit has high local mobility, with speeds up to 7 MPH for quick shifts on location, and 20-ton crane capacity, and a handy carrying platform, ideal for industrial plants, docks, shipyards, etc.

See your nearest Lorain distributor—start your postwar profit planning today. You can be sure he'll recommend the equipment that's best for your job, because he sells large and small crawler-mounted Lorains, too, as well as the rubber-tired equipment!



The Self-Propelled Crane fast on its feet in industrial storage yard.



The Self-Propelled Crane transports its own load.

A Moto-Shovel is fast on the job — and between jobs.

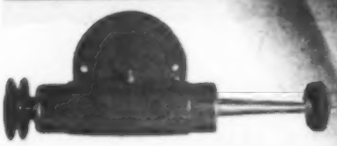
thew-Lorain Reg. Trade Mark

THE THEW SHOVEL CO.
LORAIN, OHIO

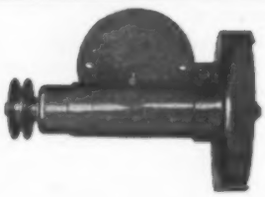
CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

THE Complete METAL-WORKING MACHINE

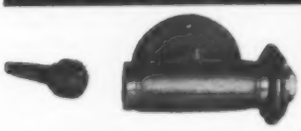
INTERNAL GRINDER



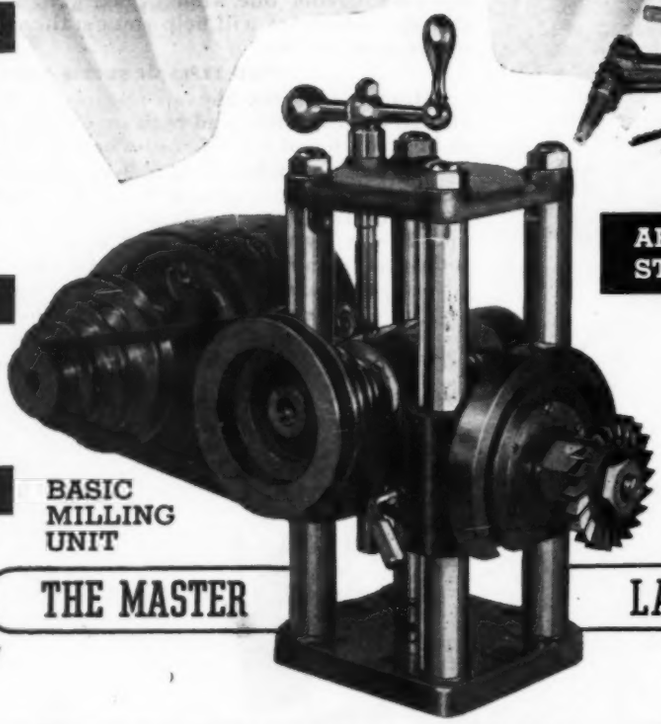
EXTERNAL GRINDER



THREAD MILLING



DIVIDING HEADS



BASIC MILLING UNIT

THE MASTER LATHE CONVERTER

INTERNAL KEYSEATING

ARBORS FOR ALL STANDARD CUTTERS

PRECISION PERFORMANCE *in Milling, Grinding, Drilling, Boring, Threading and Keyseating*

The MASTER LATHE CONVERTER, with interchangeable heads, will perform almost ANY metal work operation. Designed primarily for Engine Lathes, it can also be used on Planers, Shapers, Milling Machines, and Boring Mills.

Rugged in construction, simple in design, and accurate in operation, the MASTER CONVERTER has proved to be the MOST ADAPTABLE machine tool for maintenance, repair, tool, and experimental departments on the home front and battle front — in every major branch of the armed services.

TIME and SPACE are at a premium — maintenance and production are essential — the MASTER CONVERTER, is the answer. Why not investigate what this remarkable machine will do for you?

Catalog No. 10 Includes Operation and Maintenance Manual—ASK FOR IT!

the MASTER MANUFACTURING COMPANY
HUTCHINSON, KANSAS, U. S. A.

MM LATHE CONVERTER

ADDRESS DEPT. RS

Sure, a Shovel can win a battle—that is the *right* Shovel! The battle here was to finish the San Francisco Municipal Airport extention by February first 1945—a battle to get 3,089,000 cu. yds. of fill, three miles over two main highways and a railway, all packed with traffic.

To do this over 250,000 additional cu. yds. had to be moved and an overpass built to assure the elimination of hauling delays.

This was one of those jobs where everything had to click. There was no room for delays on the part of temperamental machinery.

It is significant that Macco Construction Co. and Morrison-Knudsen, long time Northwest users, put their Northwests on the job and their faith was well justified in the completion of the fill well ahead of time.

Dependable equipment is profitable equipment. Remember some of the things we have told you for your post-war contract plans. If you have a real Rock Shovel, you'll never have to worry about output in dirt.

NORTHWEST ENGINEERING COMPANY
1732 Steger Bldg., 28 E. Jackson Blvd., Chicago, 4 Ill.

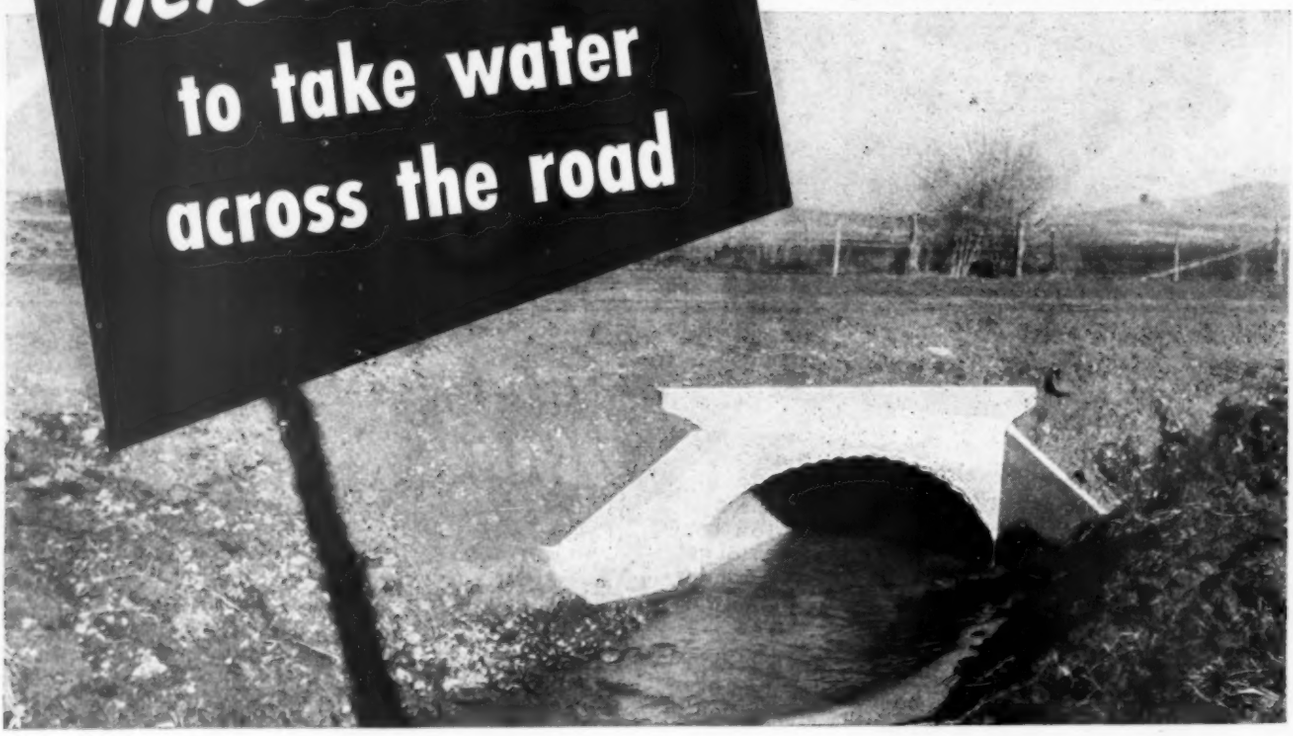
-and when you have a real Rock Shovel you won't have to worry about output in dirt

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

Six hours was all it took to replace an old narrow structure with 52 x 30-inch ARMCO Pipe-Arch. Then traffic moved again.

here's the way to take water across the road



When it's a low, wide waterway, an ARMCO Pipe-Arch makes an efficient drainage structure. It gets the water across the road quickly; yet keeps the level down without pounding.

The Pipe-Arch is a favorite with road builders everywhere. This rugged structure has all the proved advantages of corrugated metal pipe such as flexibility, resistance to impact, long and easily-handled lengths, immediate backfill—plus the fact that it "fits the ditch." Sizes range from 18x11 to 72x44 inches.

Write for the Pipe-Arch Descriptive Bulletin. It tells the whole money-saving story. Address Armco Drainage Products Association, 435 Curtis Street, Middletown, Ohio.

ARMCO

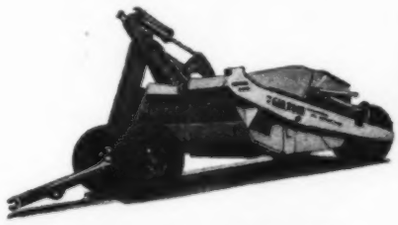
Armco Pipe-Arches

GAR WOOD ROAD MACHINERY

STAYS ON THE JOB

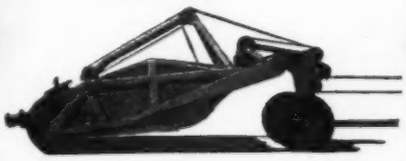
GAR WOOD GW ROAD MACHINERY TRADE MARK

CABLE DOZECASTERS with angling blade for Allis-Chalmers HD-10 and HD-14 Tractors

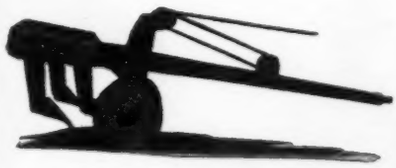


4-WHEEL HYDRAULIC SCRAPERS
Capacities: 8-10-15 cu. yds.

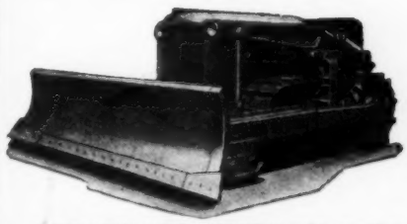
Gar Wood Industries, Inc., manufactures a complete line of heavy-duty earth-moving machinery • • • 2-wheel Scrapers, 4-wheel Scrapers, Bulldozers, Roadbuilders, Dozecasters, Rippers, Tamping Rollers and Cable Control Units. When anticipating your earth-moving equipment needs, be sure to investigate this modern well-constructed line. Your Allis-Chalmers Industrial Tractor Dealer will be happy to point out the features that make Gar Wood Road Machinery outstanding in the earth-moving equipment field. Get the maximum in performance with a minimum of "down time" • • • buy *GAR WOOD.*



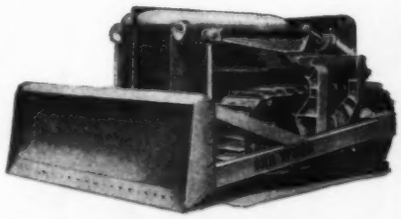
4-WHEEL CABLE SCRAPERS
Capacities: 11-15-20-25 cu. yds.



HEAVY DUTY RIPPERS
Cable and hydraulic operation



HYDRAULIC ROADBUILDERS with angling blade. For all Allis-Chalmers Tractors



HYDRAULIC BULLDOZERS with fixed blade. For all Allis-Chalmers Tractors

2-WHEEL HYDRAULIC SCRAPERS
Capacities: 3-5-6-8 cu. yds.

CABLE CONTROL UNITS. Double and single drum for 'most all makes of track-type tractors

GW ROAD MACHINERY is Sold Through ALLIS-CHALMERS Dealers Everywhere

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
DETROIT 11, MICHIGAN

OTHER PRODUCTS OF GAR WOOD INDUSTRIES INCLUDE HOISTS AND BODIES • WINCHES AND CRANES • TANKS • HEATING EQUIPMENT • MOTOR BOATS

Preformed wire rope

MULTIPLIES MANPOWER 3 WAYS

Men who actually work with wire rope prefer preformed. They give many different reasons for this choice, but the net result is more work per line before replacement.

The men say preformed wire rope handles easier. It saves installing time; it's limber—not cranky.

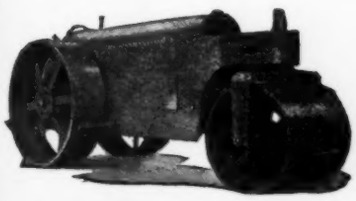
They say it whips less and spools better on drums.

It lasts longer and this means fewer interruptions to production.

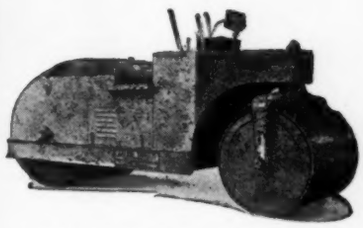
Preformed wire rope costs a little more at first but much less in the long run.

ASK YOUR OWN WIRE ROPE MANUFACTURER OR DISTRIBUTOR

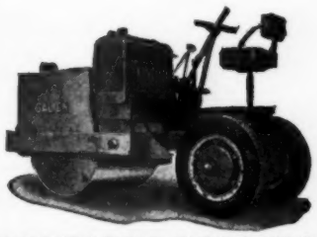
ALSO



3-WHEEL ROLLERS



TANDEM ROLLERS



PORTABLE ROLLERS

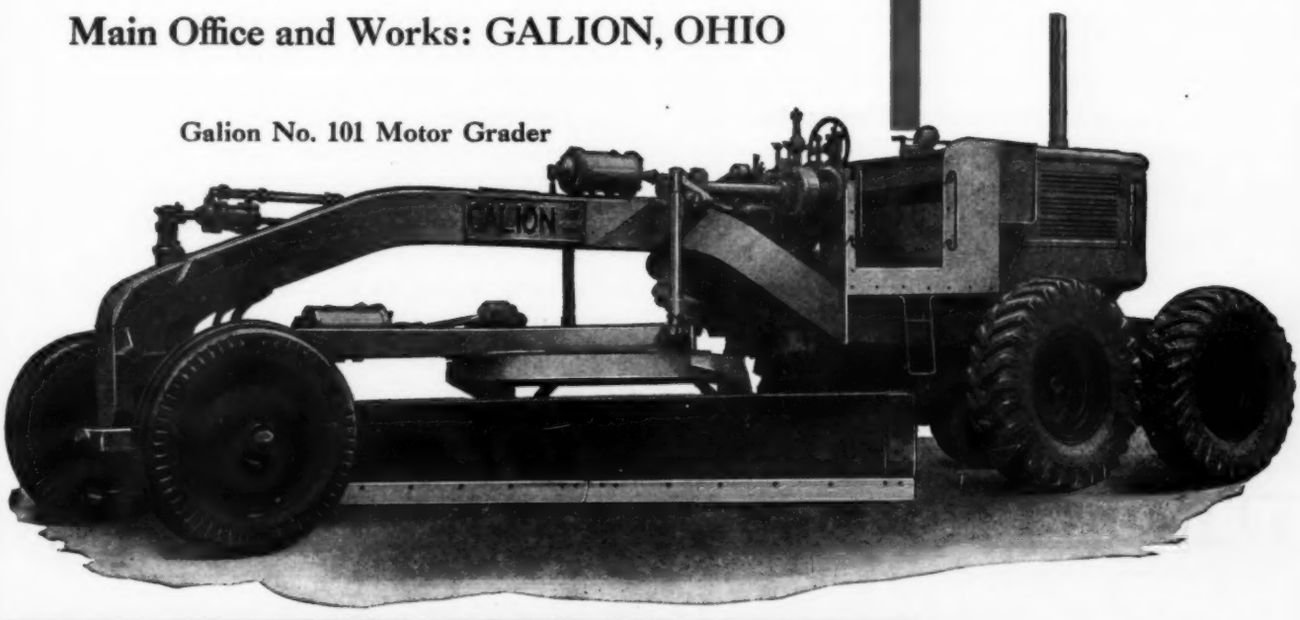
IF IT'S A GALION—THEN

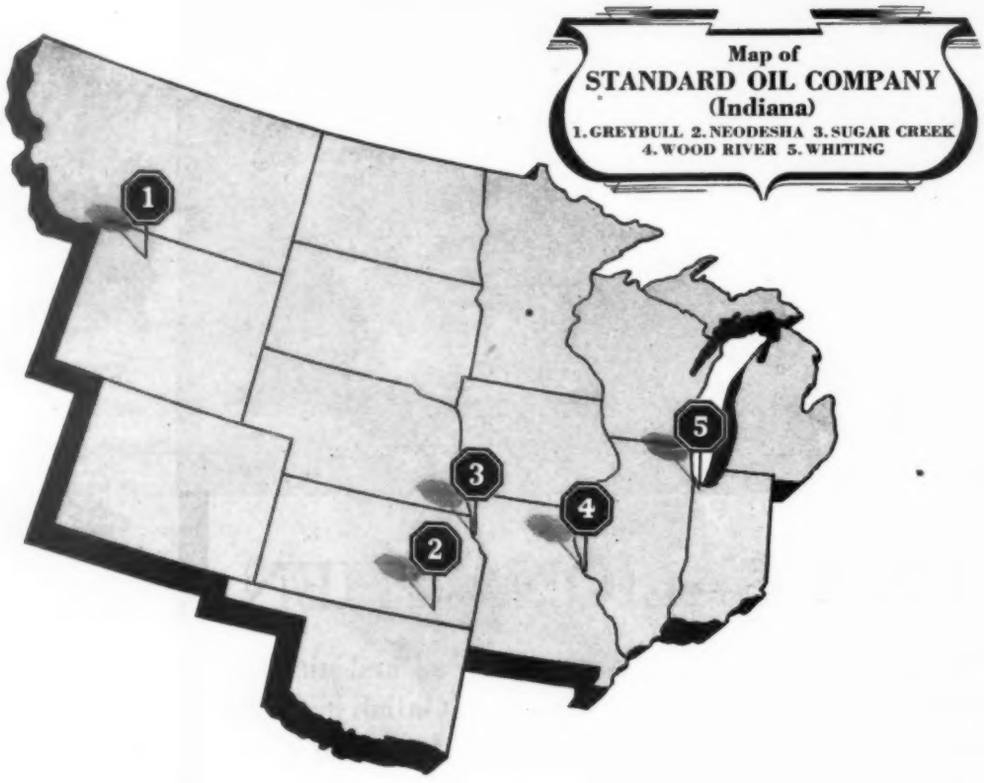
you are a jump ahead of the gun on that road and airport construction. No finer proof of the ability of Galion graders and rollers to take a lot of punishment will be found than right on the fighting fronts in this war. A war of movement . . . speed being the order of the day. Roads and airports are rushed to completion. Galion graders and rollers answer the need for efficient units to back up our fighting men. Galion is in there fighting, too. For war or peace . . . be sure it's a Galion.

THE GALION IRON WORKS & MFG. CO.

Main Office and Works: GALION, OHIO

Galion No. 101 Motor Grader





The logical source in the Middle West for ASPHALT

. . . to get shorter tank car hauls

. . . to get more reliable deliveries

. . . to save manpower, demurrage charges, and delays

YOUR prompt delivery of Asphalt for the 1945 season will depend largely upon the tank cars available and rail shipment facilities. Because of this, contractors and state and county highway departments in the Middle West can definitely profit by the widespread facilities of Standard Oil Company (Indiana).

Refineries located throughout the area make haulage distances shorter to your job. Fewer tank cars are needed to make these shorter hauls, which will help relieve the tank car shortage. Deliveries are more likely to be made on schedule, saving manpower, demurrage charges, and delays.

In addition, Standard Oil Representatives are located throughout the area to help you keep your job rolling through prompt handling of your Asphalt needs.

There is still time to start your Asphalt paving early and avoid the peak shipment season when railroad facilities are hard pressed. Help yourself to get the Asphalt you need by starting work now and ordering Asphalt for your Middle Western jobs from Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.

Buy more War Bonds

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

TRACK-TYPE TRACTORS

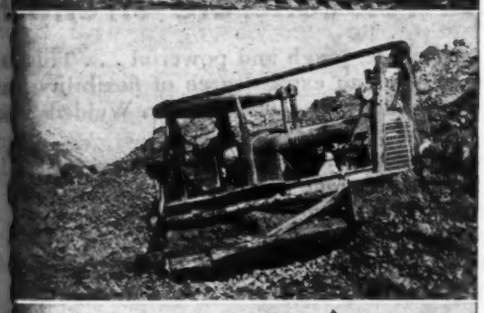
your most *Versatile* machines

Pull

Just hitch it to the drawbar! A track-type tractor efficiently handles any pulling job — hauling scrapers, graders, sheep-foot rollers, rippers and other equipment.

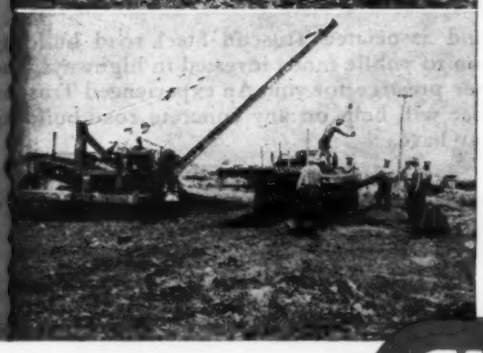
Push

Many are the jobs that call for a track-type tractor's ground-gripping traction and great pushing power — bulldozing, pusher-loading, clearing, boosting other equipment!



Lift

You can make a crane, a hoist or a shovel out of a tractor by simply mounting the auxiliary equipment. Your track-type tractor is your basic tool!

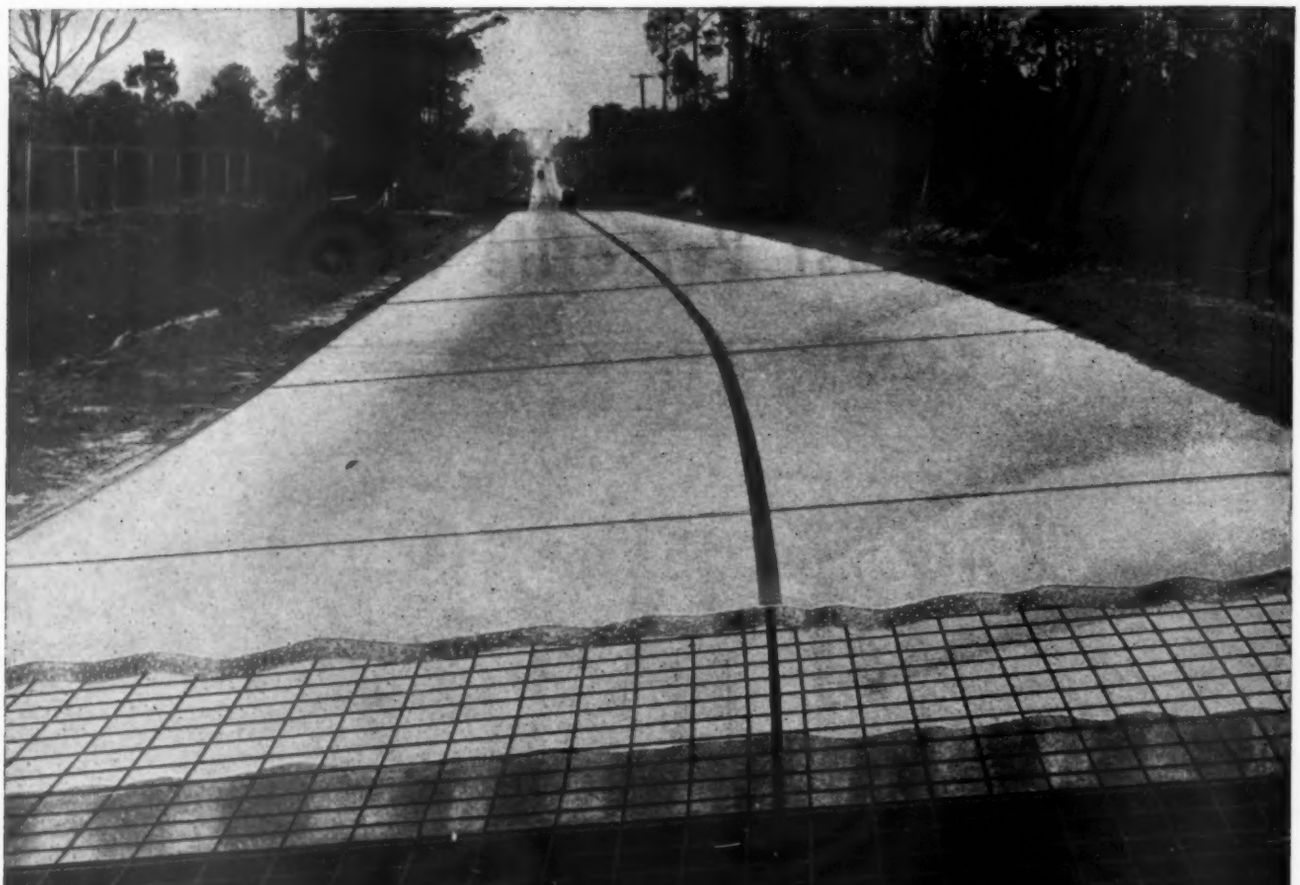


Bristling with power and built to use it, track-type tractors are your most useful machines — handle a greater variety of jobs, go most anywhere at any time, operate efficiently under severest conditions. Work in mud, sand, clay, gravel, rock, dirt . . . in lowlands or mountains, on steep grades, narrowest quarters, any climate! A complete selection of attachments for pulling, pushing, lifting, widens your tractor's usefulness . . . reduces equipment investment and operating cost. To get jobs done right, quick, at greater savings, assign them to your TRACK-TYPE TRACTORS!

Buy Bigger Bonds . . . For the Bigger Seventh!

WATCH 2-CYCLE . . . *the Modern Diesel Power*

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.



TRUSCON Welded Steel Fabric

. . . built-in sinews for concrete strength

Like giant interlacing muscles . . . flexible, tough and powerful . . . Truscon Welded Steel Fabric gives concrete slabs an extra degree of flexibility and strength that increases life and lowers ultimate costs. Truscon Welded Steel Fabric assures:

Resistance to cracking during setting period.
Tensile strength against subgrade friction.
Resistance to cracking due to warping.
Resistance to development and opening of cracks.
Resistance to slab separation.
Decrease of spalling and disintegration.

Truscon Welded Steel Fabric and associated Truscon Steel road building products give adequate protection to public funds invested in highways, and will build greater prestige for you. An experienced Truscon highway engineer will help on any concrete road building problem you may have.

TRUSCON STEEL COMPANY
Youngstown 1, Ohio
Subsidiary of
Republic Steel Corporation

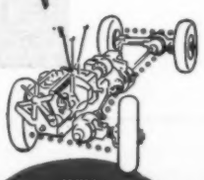
FWDs MAKE THE MOST OF *Truck* POWER AND *Man* POWER

In everyday duty on highway construction and maintenance, FWDs regularly do 61 jobs. Including special jobs, there are more . . . write for list. For all year 'round highway work, you can always depend on FWDs.

FWD trucks . . . rugged, reliable, modern . . . embody the highest development of the original four-wheel-drive principle, pioneered and advanced by FWD since 1910. The true FWD principle with center differential and properly balanced power on all wheels, gives these trucks outstanding mechanical advantages and highway performance leadership . . . the FWD principle that provides the power and stamina to get through, regardless of weather, road conditions, or lack of roads, with greater assurance and safety. Balanced weight distribution on all four wheels conserves precious tires, replacements, oil and gas.

As leaders in performance, economy and style, FWDs are a great "buy" for highway service. Their value is so widely recognized that they outnumber all other four-wheel-drives 4 to 1 in this field of heavy-duty truck work.

THE FOUR WHEEL DRIVE AUTO COMPANY, Clintonville, Wisconsin
Canadian Factory: Kitchener, Ontario



FWD
TRUCKS
THE ORIGINAL EXCLUSIVE BUILDERS OF FOUR-WHEEL-DRIVE TRUCKS

More than $75,000,000 in purchases of FWD Model SU alone in the comparatively short span of forty-eight months, emphasizes FWD leadership in this field!

FWD's MODEL SU

SHOVE A LONG - LONG - TIME

That's the future of your equipment. Especially when you apply MIR-O-COL hard-facing metals to scraper blades, tractor sprockets, ditcher teeth and a host of other wear points on your road machinery. Alloyed to fight wear, maintenance engineers specify hard-facing to save equipment repair costs. Learn how you can lower your equipment use-per-hour rate by writing for specific rod application data today.

AT YOUR REQUEST a copy of "Weldors Guide to Successful Hard-Facing" will be sent FREE.

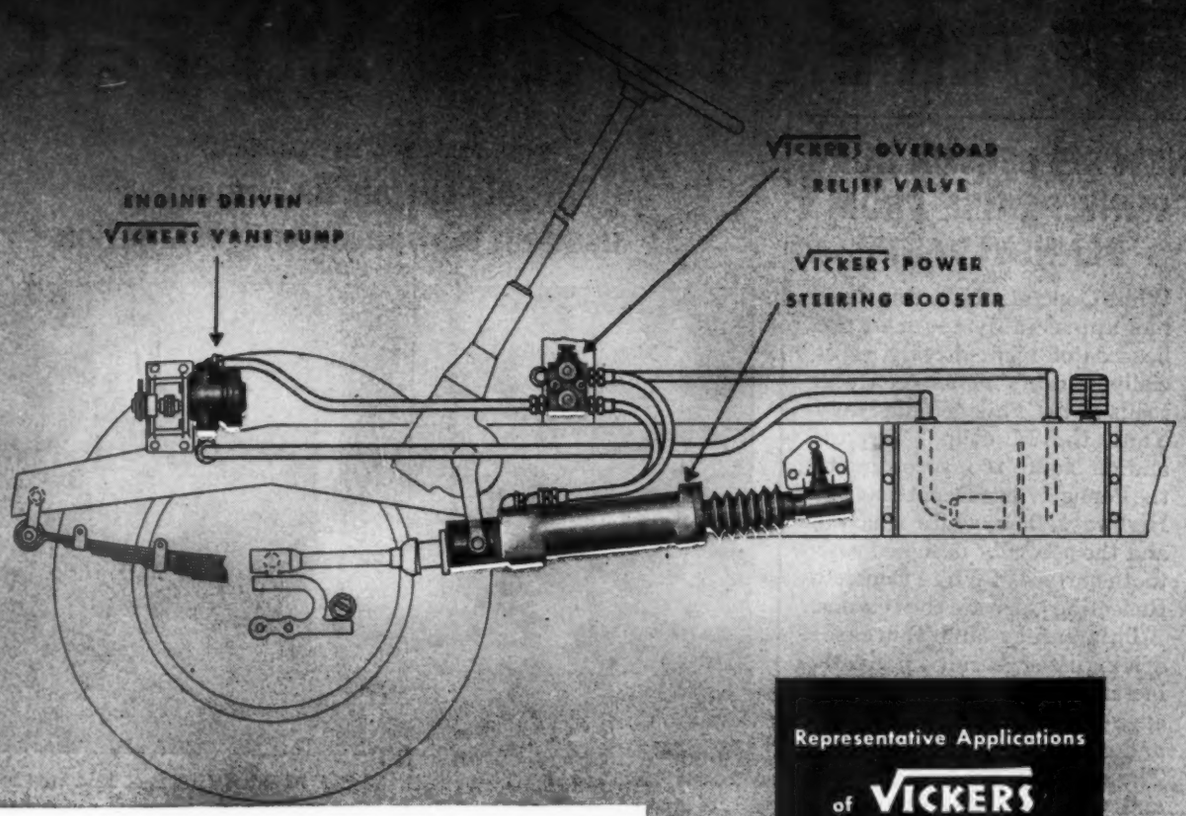
Manufactured by

MIR-O-COL
HARD-FACING RODS
ALLOY COMPANY

2416-60 EAST 53RD STREET, LOS ANGELES, CALIFORNIA

COMPACT

Another Important Advantage of



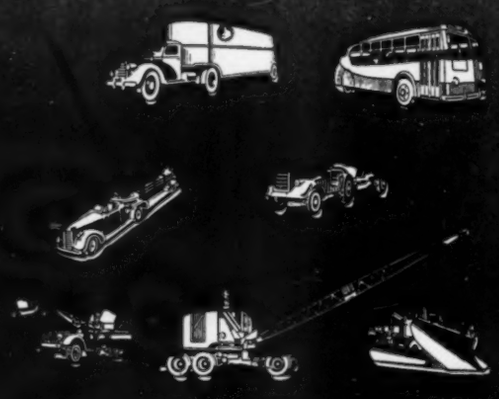
Requiring only a minimum of space for installation, the Vickers Hydraulic Power Steering System can be applied to most existing hand steering mechanisms with a few simple alterations. The separate power cylinder (booster) can be located where it does not interfere with other apparatus and where the power will be applied directly to (and in line with) the drag link. No additional space is required at the end of the steering column where space is usually at a premium.

Other important advantages of Vickers Hydraulic Power Steering are: effortless, positive and shockless steering . . . road shock thrusts are transmitted to the frame of the vehicle instead of to the steering gear . . . automatic overload protection . . . reduced operator fatigue . . . greater road safety . . . automatic lubrication . . . and 15 years of successful operating experience. Bulletin 44-30 gives complete information about Vickers Hydraulic Power Steering; write for a copy.

VICKERS *Incorporated*

1400 OAKMAN BLVD. • DETROIT 32, MICHIGAN
Application Engineering Offices: CHICAGO • CINCINNATI • CLEVELAND • DETROIT
LOS ANGELES • NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD
TULSA • WORCESTER

Representative Applications of VICKERS HYDRAULIC POWER STEERING



CONCRETE HIGHWAY NEWS
Universal Atlas Cement Company (United States Steel Corporation Subsidiary)
Chrysler Building, New York 17, N. Y.

OFFICES: New York, Chicago, Albany, Boston, Philadelphia, Pittsburgh, Minneapolis, Duluth, Cleveland, St. Louis, Kansas City, Des Moines, Birmingham, Waco

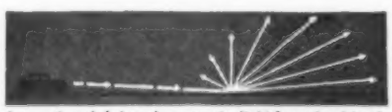
ILLINOIS TEST SHOWS DURABILITY OF AIR-ENTRAINING CONCRETE

NEW REFLECTOR CURB WINS PRAISE FROM PENNSYLVANIA

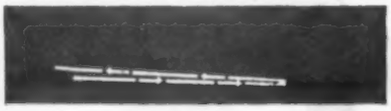
White Concrete Reflecting Curb has appreciably reduced the hazards of night driving, especially on rainy nights, on access roads to the Philadelphia Navy Yard, the Municipal Airport, and on Route 263, according to the Pennsylvania Department of Highways. The white concrete and the specially designed saw-tooth surface of White Concrete Reflecting Curb are the reasons.

This safety curb increases driving safety because it greatly increases visibility of the road's edge—in the daytime, at night, and especially on rainy nights. The diagram below shows how and why it is such an efficient safeguard.

Write to Universal Atlas for a copy of the book, "A White Guide to Safety." It contains full information on the design and installation of white concrete reflecting curb.



A smooth curb (above) wastes the light from the driver's headlamps—reflects it up and away from the driver. A White Concrete Reflecting Curb (below) conserves this light—reflects it back to the driver. A smooth curb is barely visible at night; a White Concrete Reflecting Curb stands out bright and clear.



RS-DC-7

Atlas Duraplastic* air-entraining cement used on test pavement installation

Test installations on South Archer Avenue, Chicago, laid in 1941. Left: eastbound lane placed with Atlas Duraplastic is practically scale-free. Right: westbound lane placed with normal portland cement shows scaling after identical salt de-icing treatment.

THE ILLINOIS DIVISION OF HIGHWAYS conducted an extensive investigation on the use of air-entraining portland cement on a busy sector of Archer Avenue, Chicago, a main artery to the Municipal Airport. Field and laboratory investigation of this installation shows that Atlas Duraplastic is highly resistant to the effects of freezing and thawing weather and to the scaling action of de-icing salts.

As a result of this study and of street, highway and airport installations elsewhere, air-entraining cement is now required for all state concrete highways in metropolitan Chicago.

Write to Universal Atlas for further information on the use of Duraplastic —the air-entraining portland cement that makes concrete more durable and more plastic.

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UNIVERSAL ATLAS CEMENTS

UNIVERSAL PORTLAND • ATLAS PORTLAND • ATLAS MORTAR CEMENT • ATLAS WHITE • ATLAS DURAPLASTIC • ATLAS HIGH-EARLY

PAA AIRWAYS SYSTEM PHOTOGRAPH

That's the story of many of the airfields at home and abroad via which men and materials are today reaching our far-flung fighting fronts. We're proud of the war-time job the new Huber Rollers have done and are doing, and you'll be just as favorably impressed with their performance when they're again available . . . soon, we hope . . . for peacetime construction assignments.

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER ROLLERS

THEY PICK UP "EGGS" WITH WIRE ROPE

Giant "eggs" for our bombers require frequent handling before they are dropped on the enemy. Juggling heavy bombs is one of the vital everyday tasks which our men must perform . . . and one in which tough, dependable wire rope is important.

Less dramatic, but equally important, is the work which wire rope is doing on the home front. In oil fields, forests, mines, mills and shipyards . . . you'll find men relying on the stout, steel muscles of Wickwire Spencer Wire Rope to do a variety of heavy hoisting and hauling jobs.

With wire rope harder to get, each length must be made to last longer. And, when you need new rope, specify WISSCOLAY *Pre*formed, manufactured by Wickwire Spencer. It lasts longer than the non-preformed; is easier to cut, splice and install; is kink-resistant and safer to handle.

If you have a wire rope problem our wire rope engineers will be happy to help solve it. Just write Wickwire Spencer Steel Company, 500 Fifth Avenue, New York 18, N. Y.

THIS FREE BOOK SHOWS HOW TO MAKE WIRE ROPE LAST LONGER

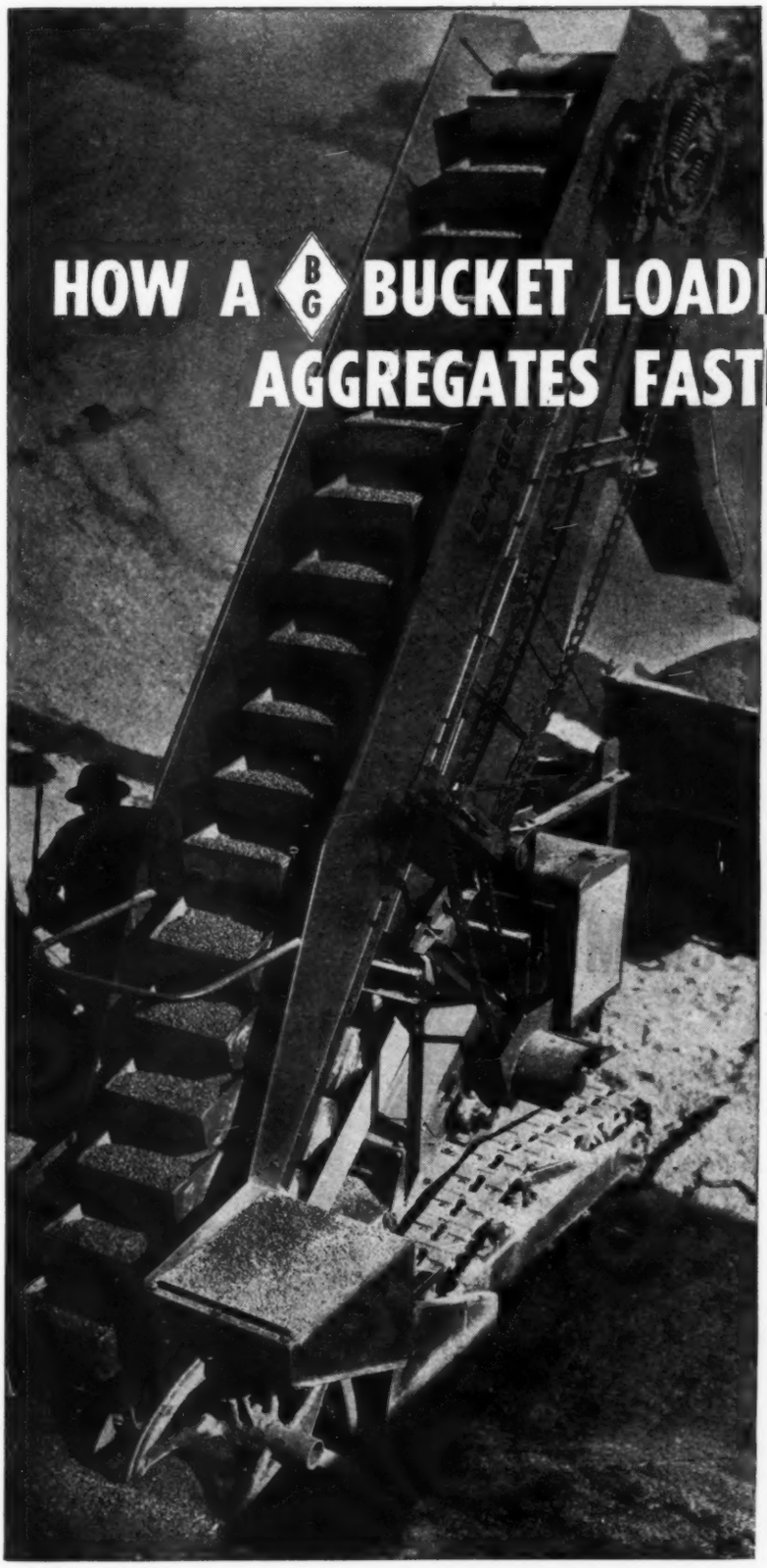
"Know Your Ropes" contains 82 pages of suggestions on proper selection, application and usage of wire rope. This easy-to-read, profusely illustrated manual can save you money . . . and save wire rope for the war fronts. Send for your free copy now.

Send your wire rope questions to:

WICKWIRE SPENCER STEEL COMPANY

500 FIFTH AVENUE, NEW YORK 18, N. Y.

Abilene • Boston • Buffalo • Chattanooga • Chicago • Clinton (Mass.) • Detroit • Houston • Los Angeles • Philadelphia • San Francisco • Tulsa • Worcester



HOW A B-G BUCKET LOADER HELPS HANDLE AGGREGATES FASTER AND CHEAPER

THIS versatile Barber-Greene Bucket Loader is a valuable job-coordinating unit in pit and quarry.

You can save money by processing aggregate at a uniform rate, even during "off" seasons, and storing it in stockpiles.

A Barber-Greene will reload it into trucks, whenever needed, at exceptionally low cost. In fact, many operators have found that the saving in truck time alone justifies its purchase.

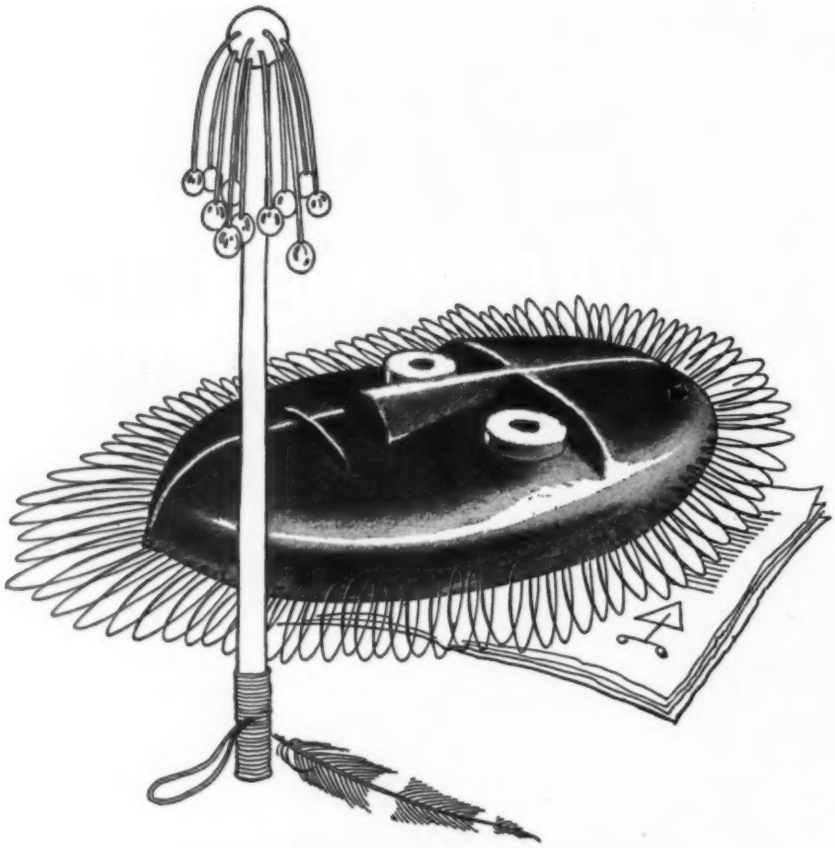
Continuous handling by the B-G Loader is extremely advantageous in feeding material to processing equipment — screens, crushers, belt conveyors.

The B-G Bucket Loader also can be used for stripping, light excavating, screening, and many other cost-saving applications.

Full crawler mounting, tank type chassis, automatic overload release, synchronized spiral feeding, floating boom, centralized control, and 12 crowding speeds are but a few of the advanced mechanical features that give the B-G Loader long life and fine performance under the rigors of heavy, steady work. Consult your B-G representative or write the Barber-Greene Company, Aurora, Illinois.

44-28

Barber-Greene B-G *Constant Flow Equipment*



Black Magic

made simple

This black magic has been performing for years. It has transformed old, worn out highways into ribbons of beauty and safety; it has protected tires from harsh wear on broken pavements; it has eliminated the glare of sunlight on roads; it has made highways skid-resistant; it has saved Highway Departments money.

This black magic is Tarmac.

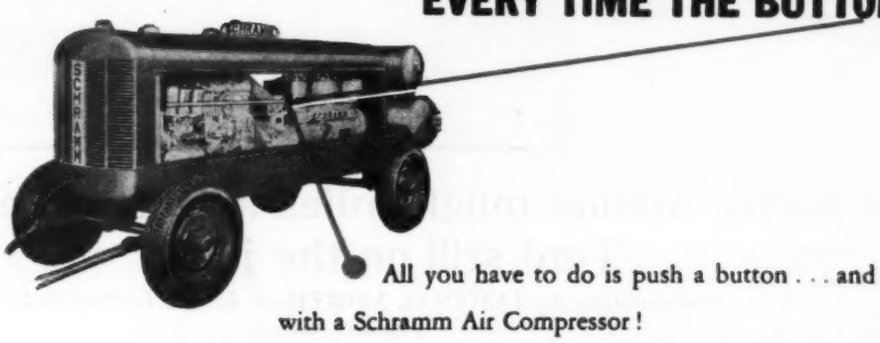
Now is a good time to cash in on some of this black magic by protecting and improving your present highways with a Tarmac Surface Treatment or Tarmac Road Mix. The new booklet, "Surfacing with Tarmac" describes the various types of construction and maintenance possible with Tarmac. Send for your copy.

KOPPERS COMPANY, INC.

Tar and Chemical Division · Pittsburgh 19, Pa.

Compressed Air...

EVERY TIME THE BUTTON IS PUSHED!



All you have to do is push a button . . . and get all the air you need with a Schramm Air Compressor!

This is a feature worth having in an air compressor. In addition, Schramms are lightweight, easy to move about, and are 100 per cent watercooled to provide ideal performance both summer and winter.

Four Schramms were used on the road construction job illustrated above. It is only one of many jobs where Schramm was specified to do the job. Air obtained easily . . . constantly . . . that's what makes your construction job easier. If you use compressed air, it will pay you to write for descriptive literature and details.

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

MORE FORD TRUCKS ON THE ROAD • ON MORE JOBS • FOR MORE GOOD REASONS

TRUCK-ENGINEERED **Stamina!**

This Ford tractor fleet of 9 is operated by James G. North & Sons. Bodies are 8- and 10-yard semi-dump units. The job is the stretch of U.S. 66 described recently in "Roads & Streets," the contractor Arizona Sand & Rock Co. These trucks have covered upwards of a quarter-million miles each. Operation is reported very satisfactory. All units are still in service.

Quarter-million tough miles apiece and every Ford still on the job!

—according to JAMES G. NORTH *of James G. North & Sons*
Phoenix, Arizona

STAMINA — ENDURANCE — has been engineered in generous measure into every chassis in the Ford Truck line. This stamina, put there by true truck engineering, shows up in long life, reliability and low ton-mile costs. Some million and a half Ford Trucks in service are proving this daily.

Ford Truck stamina begins in Ford Truck engineering. It reaches into every frame-section dimension, every chassis specification, every feature of engine design.

In scores of ways, this Ford stamina finds its way into your truck. It's there in special wear-resisting alloy steels, and in chassis or engine parts made longer-lasting by processes pioneered by Ford. It's there in cooling and lubrication and electrical units of extra capacity, longer life and easier maintenance.

The moderate price of your sturdy Ford puts this truck stamina to work for you economically. Replacement parts are never costly, and expert Ford Service is seldom more than a few minutes' drive from wherever you are. A third of America's trucks are Fords . . . for all of these good reasons.

Under government allocation, present production of Ford Trucks is necessarily limited as to types, equipment and quantities, for essential civilian needs. See your near-by Ford Truck dealer for friendly counsel in obtaining official certification of your requirements.

TRUE TRUCK ENGINEERING

Powerful truck engines—Six chassis types—for 95% of all hauling jobs.

FAMOUS FORD FEATURES

- Service ease . . . engine crankcase, transmission, clutch and other chassis units readily accessible, hence—
- Low maintenance cost.
- Universal service facilities.
- Heavy-duty front axle—massive spindles—large taper roller wheel bearings.
- Extra-sturdy full-floating rear axle—pinion straddle-mounted on 3 large roller bearings—3 axle ratios available—2-speed axle optional at extra cost.
- Powerful hydraulic brakes—exceptionally large cast drums.
- Needle bearing universal joints.
- Rugged 4-speed transmission—large roller bearings.
- Shifto-Guide speedometer dial—saves fuel—saves wear.
- All-steel comfort cab—safety glass.

Ford

FORD TRUCKS

AND COMMERCIAL CARS

TRUCK-ENGINEERED • TRUCK-BUILT • BY TRUCK MEN

the Job—
Pouring 40,000 yards of concrete with a record of 792 Cubic Yards in 9 Hours
the Equipment
This 34E
MultiFoote Paver

ANOTHER hurry-up job, completed in record time with the usual MultiFoote efficiency, was the building of a West Coast military airport access road requiring 40,000 cubic yards of concrete. Typical of the high hourly production of all MultiFoote 34E Pavers was the pouring of 792 cubic yards of concrete in a nine-hour period.

Note particularly the operator on his high platform which makes possible faster, more accurate work. At the widest angle of the boom the bucket is visible, the pan of the skip is in view and its full width can be seen without stretching around machinery. A simple control system gives an automatic mixing cycle that utilizes every mechanical advantage for speed. This mechanical cycle can be varied at the will of the operator from automatic to manual operation at any time, allowing him to take full advantage of any condition that might develop. Add to this all the other MultiFoote features and you have the reason why there are more MultiFoote pavers than all others. See your local dealer or write for details.

THE FOOTE CO., INC.

1936 State Street **Nunda, New York**

ARMY E NAVY

MULTIFOOTE

ADNUN BLACK TOP PAVER

CONCRETE PAVERS

Emblem of all-truck stamina, of rugged dependability and economical operation! Yes, the International Triple Diamond trade-mark at left above is the identifying mark on powerful trucks—trucks that faithfully hauled raw materials and finished goods for America at peace . . . that haul raw materials and finished products for America at war . . . that are fighting instruments in the hands of fighting men on Allied fronts everywhere.

One measure of International Truck quality is this—in the 10 years before the war more heavy-duty International Trucks were sold than any other make. Another is—International Truck Service, the nation's largest company-owned truck-service organization.

International Harvester products are a family—trucks, industrial power, farm tractors and farm equipment. A new symbol to identify the family *as a family* has been chosen—the IH at right above. This symbol does not displace the Triple Diamond on International Trucks. It means Product of International Harvester—vital, basic and essential to America at war and peace.

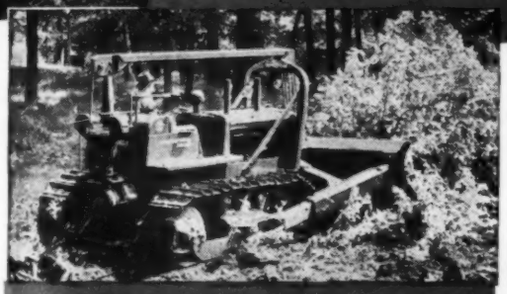
INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

INTERNATIONAL Trucks

A Heil Cable Trailbuilder or Bull Dozer, mounted on your International TracTracTor, provides a perfectly balanced team.

HEIL "engine-mounted" CABLE DOZERS

R-47



Heil Trailbuilders operate efficiently and dependably in clearing lands of undergrowth.

(Above) Even sturdy trees give way to the power behind the Heil Cable Trailbuilder.

(Below) Operator has full visibility at all times.

give you

full benefit of all the power furnished by your International TracTracTor . . .

The new engine-mounted attachment gives complete freedom of operation to the tractor at all times. The side mounting plates tend to reinforce the engine frame. All stresses are self-contained, and the weight is distributed evenly to give you a perfect balance — with no loss of power caused by an uneven distribution of weight.

The short push arms, located at the central balance point, provide a great down-pushing pressure on the blade cutting-edge, and keep the track at full length on the ground during the digging operation — making use of the entire drawbar horsepower of the tractor.

With a Heil Cable Trailbuilder or Bull Dozer on your TracTracTor, you get plenty of driving and penetrating power at the blade — to move more "pay dirt" with each load.

For many reasons why famous Heil Quality-Built Earth-Moving Equipment leads the field in long-time, low-cost service —

See Your INTERNATIONAL TRACTRACTOR DISTRIBUTOR

ARMY E NAVY

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

A NEW STANDARD FOR HEAVY-DUTY TRUCKS

The Army called for the roughest, toughest truck that could be built, designed to *begin* its job where most other trucks stop.

Ward LaFrance has been producing this super truck in volume for Army ordnance. Out of it has come an entirely new standard of heavy-duty truck reliability and performance. Ward LaFrance has been building good trucks for a quarter of a century, but frankly, never any that could compare with these new commercial models inspired by the design and performance of the Army M1A1 Heavy Wrecker. They are *big* trucks with pay load capacity ranging up to thirty tons. They are built to take a beating and still stay on the job. They are designed, engineered, and manufactured to establish new standards in low-cost hauling. Before you invest, investigate Ward LaFrance.

FRANCHISES ARE AVAILABLE to aggressive dealers in a number of attractive territories. Leading dealers now handling smaller, non-competitive trucks will be especially interested in the Ward LaFrance dealer plan.

WARD LAFRANCE

TRUCK DIVISION

GREAT AMERICAN INDUSTRIES, INC.

ELMIRA, NEW YORK

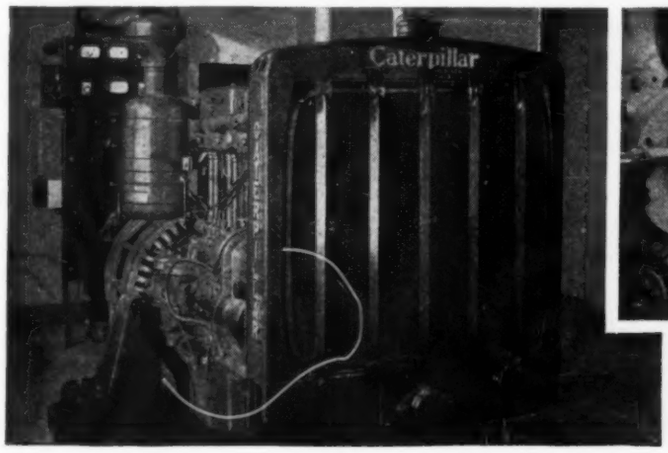
THE YEARS TELL THE *Story of their life*

WHEN you buy a "Caterpillar" Diesel Engine,* it won't take you long to discover the size of the load it can handle. Or the amount of machinery it can drive. Or the smoothness with which it runs. Or the little attention — and practically no adjustments — it requires. Or the amazing amount of power it can wring out of a gallon of low-grade, low-cost fuel.

For these things can be measured. Or seen. Or figured in economical dollars and cents.

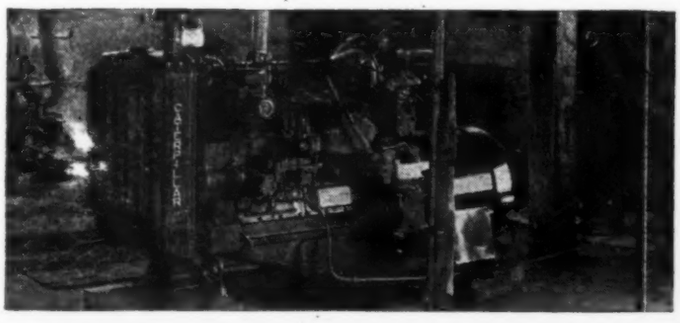
But to estimate its maximum serviceable life would ordinarily be a matter of waiting — for years. Today, however, you can judge pretty closely by the records of plenty of other engines just like it . . . work engines that have "been through the mill" and have many thousands of hours of actual running behind them. Cited here are just a few of such records.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



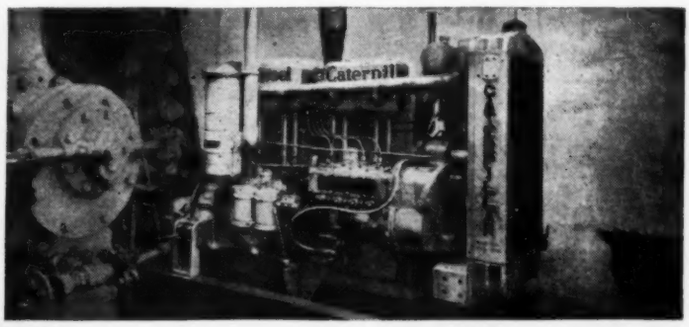
21,400 HOURS

This "Caterpillar" Diesel Electric Set was installed nearly seven years ago as an emergency lighting plant at the Syracuse Airport. Required only 12c worth of repairs during its first 3½ years of service.



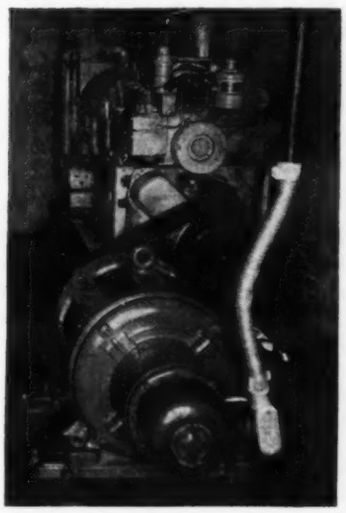
34,400 HOURS

This "Caterpillar" Diesel D4400 powering electric generator was installed in 1940. Operates 24 hours a day furnishing light and power for the town of Haswell, Colo.



65,000 HOURS

A "granddaddy" among "Caterpillar" Diesels, this D7700 drives an ammonia compressor used in cooling two rooms for the A. J. Krecker Co., Chicago. Record includes 9000 hours of almost continuous running with little or no maintenance expense.



32,000 HOURS

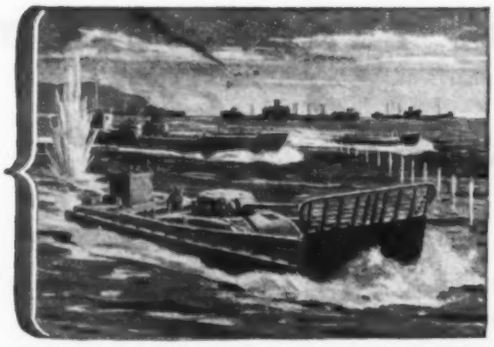
This record was made by this "Caterpillar" Diesel D4400 in exactly 5½ years, producing power for incubators, battery brooders, water pumps, lights, etc., for the Bolton Farms Hatchery, Schoeneck, Pa. Runs 24 hours a day, seven days a week, and is seldom shut down more than once in two weeks.

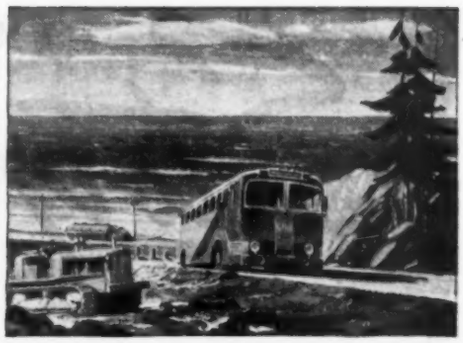
CATERPILLAR DIESEL ENGINES

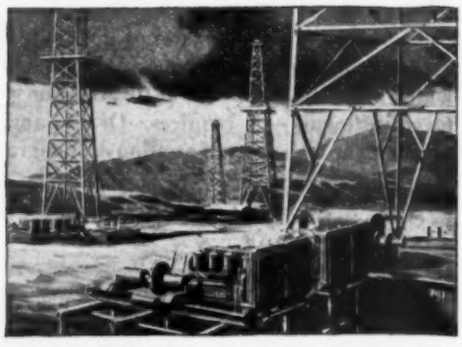
REG. U.S. PAT. OFF.

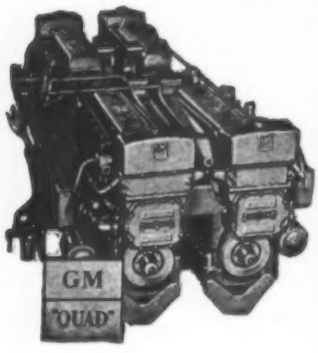
* The horsepower of "Caterpillar" Diesel Engines is ALL WORKPOWER. Ratings show sustained output of a fully equipped engine—not the momentary peak performance of a power-plant stripped of fan, pumps or other necessary accessories.

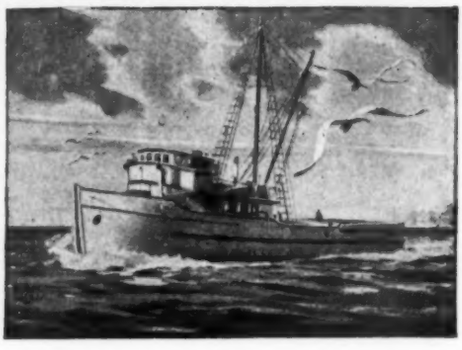
TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT











"SINGLE", "TWIN" OR "QUAD"

This is the story of how one basic engine, a favorite everywhere it runs, has become a winner even in applications which demand two to four times its power.

The engine is the General Motors series 71 Diesel which, back in peaceful days, showed the world what dependable low-cost Diesel power could do on farms, highways and on scores of construction projects where developments in progress were quick to recognize the advantages of packing more power into less weight and space.

It's busy now all over the world powering landing craft and machinery that is building landing strips and leveling jungles.

Where double the power is needed and space is cramped, two engines are joined side by side. Such "Twins" are used in M-3 and M-4 tanks and M-10 destroyers.

In its third form, two "Twins" are joined end to end, forming a "Quad." It is two of these "Quads" that drive the twin screws of the famous LCI's (landing craft infantry), fastest of all landing craft.

But whether "Single," "Twin" or "Quad" these GM series 71 engines are promising many advantages for power users on big jobs and little. With a range of horsepower to fit almost every need, the GM Diesel will be a good bet for everyone who wants dependable power at low cost.

KEEP AMERICA STRONG
BUY MORE WAR BONDS

GM
GENERAL MOTORS
DIESEL POWER

ENGINES . . 15 to 250 H. P. . . **DETROIT DIESEL ENGINE DIVISION,** Detroit 23, Mich.

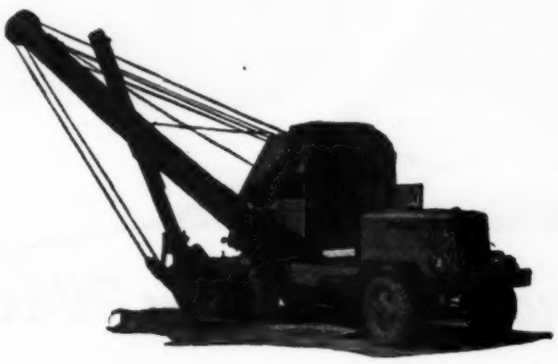
ENGINES . . 150 to 2000 H. P. . . CLEVELAND DIESEL ENGINE DIVISION, Cleveland 11, Ohio

LOCOMOTIVES . . . . . ELECTRO-MOTIVE DIVISION, La Grange, Ill.

SHOVELS AND CRANES
CRAWLER AND TRUCK MOUNTED

Engineers and contractors know that Uncle Sam is getting all of today's Hanson Production. They have to wait but they're looking ahead. They realize that tomorrow's working conditions will call for the most efficient equipment they can buy. Their experience with Hansons tells them that Hanson Shovels and Cranes will give them what they need to meet the toughest conditions. So the far-seeing ones are checking now on the possibility of Hanson deliveries.

If you don't know Hansons, it's a good time to find out about them. Get full information now. Then you'll be set for the big jobs ahead.



⅜ and ½ Cu. Yd. Capacity Shovels
4 and 6-Ton Capacity Cranes

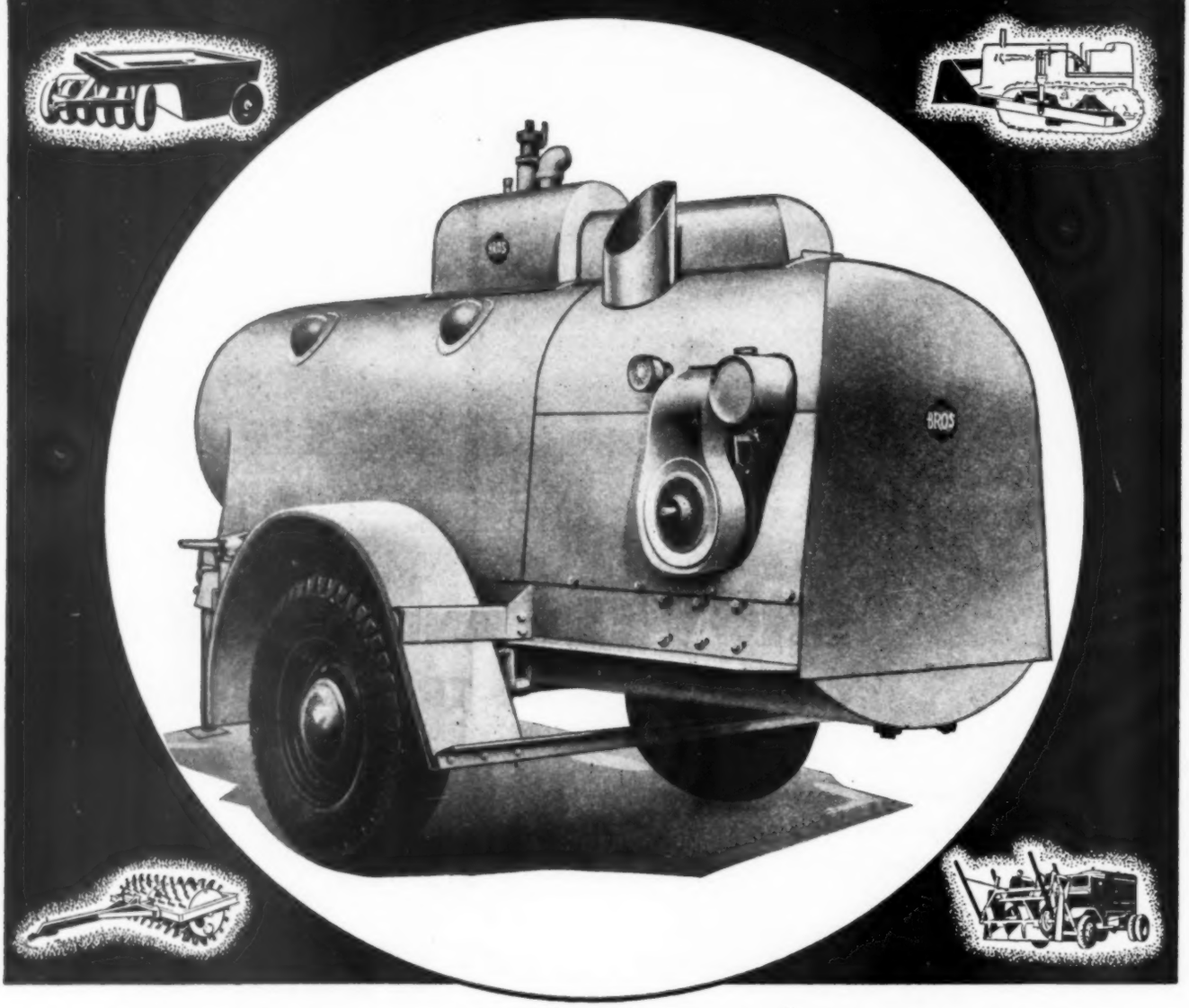
Full Revolving—Low Center of Gravity—Rugged Welded Steel Construction—Flexible—Speedy—Safer

Convertible to

Shovel—Crane—Dragline—Pile Driver—Clamshell—Trench Hoe

THE HANSON CLUTCH AND MACHINERY CO.
TIFFIN, OHIO

HEAT AND POWER



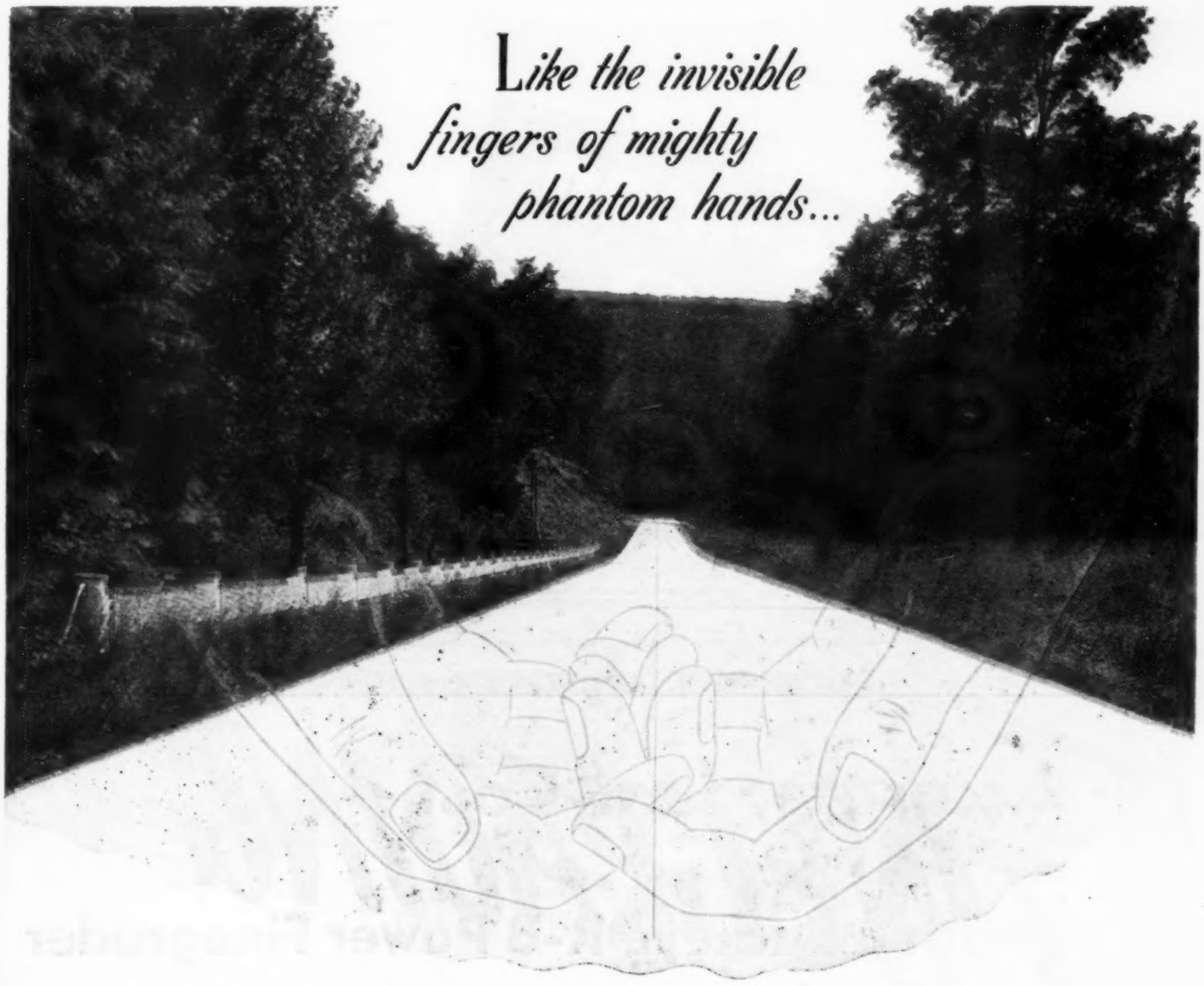
From Steam on Wheels with BROS HEATERS

Here is real steam generation—full pressure hot dry steam within twenty minutes from a cold start—in ample quantities for the job. Will handle from two to five 10,000 gallon cars daily and can be used for heating storage tanks, thawing frozen culverts, heating concrete aggregates, operating pile drivers and any other use requiring high pressure steam.

Compactly built, light in weight, Bros Heaters are readily portable and can be quickly wheeled into operating position. Quick adjustment to the amount of steam needed to balance any load is made possible by flame control air-atomizing burner. When heating tank cars with recovery of the condensate, maximum efficiency is obtained per pound of fuel oil consumed. Which proves, "You get the most from a Bros." Wm. Bros Boiler & Mfg. Co., Minneapolis 14, Minn.

BROS

FABRICATORS OF STEEL • BOILERS • STOKERS • TANKS • ROAD EQUIPMENT



Pittsburgh Reinforcement Protects This Highway

A couple of inches below the surface of this gleamingly perfect highway is embedded the invisible protector of the modern concrete road . . . *Pittsburgh Welded Wire Reinforcement.*

The interlocked "fingers" of steel literally *bind* the concrete into integrated slabs of greater strength, longer life and more lasting beauty . . . by *controlling or minimizing the effects of destructive forces.*

Pittsburgh Reinforcement adds to concrete the great strength inherent to steel. It controls incipient cracks by preventing progressive spreading induced by moisture and freezing. It provides increased resistance to traffic load. It compensates for the stresses resulting from differences in expansions between surface and subgrade. It reduces maintenance costs to a minimum.

Proved in the highways of today, no concrete-road of tomorrow will be considered adequately protected without *Pittsburgh Reinforcement.*

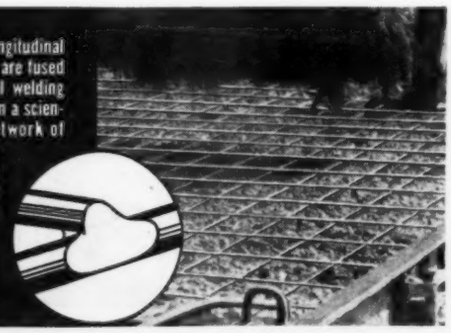
PITTSBURGH STEEL COMPANY • 1661 GRANT BUILDING • PITTSBURGH 30, PA.

PITTSBURGH

Welded Wire

REINFORCEMENT

The heavy gauge longitudinal and transverse wires are fused together by electrical welding at every joint to form a scientifically spaced network of wires that literally "binds" concrete into integrated slabs of far greater strength and rigidity.



Accurate, low-cost FINEGRADING

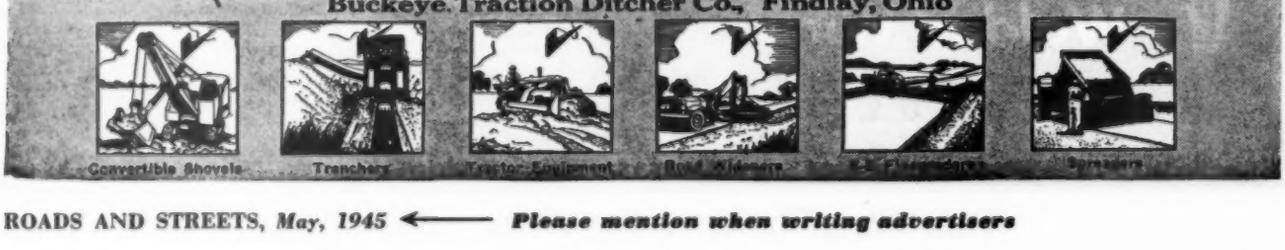
with a Buckeye R-B Power Finegrader

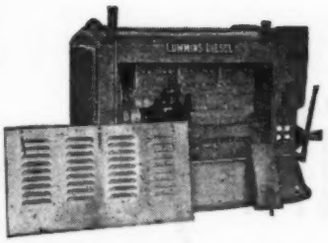
TODAY, with labor at a premium and speed a necessity, there is more than ever, a need for accurate, high-speed sub-grading. The R-B Power Finegrader cuts the grade exactly to specifications — ready for the paving crew. Gone is the need for shoveling and raking to fill in the low spots, level off the high ones. In all kinds of soil, from sticky gumbo to hard, rock-laden top-soil, the Finegrader does the grading job quickly and accurately. And at the lowest possible cost in time and manpower. Write today for all the details of this profit-making grading equipment.

RB POWER FINEGRADER

Built by Buckeye

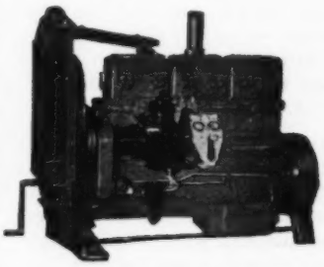
Buckeye Traction Ditcher Co., Findlay, Ohio





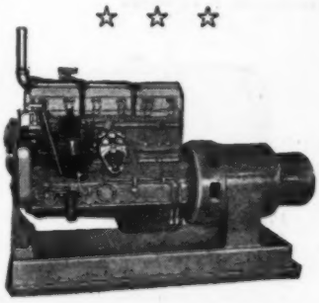
Model H Cummins Diesel is offered in both four and six-cylinder arrangements, developing maximum output of 100 and 150 hp., respectively. This engine is manufactured in a complete line of industrial and automotive models, such as the Model HP-600 power unit, shown above, and Model HBI-600, right, for wheel or track-mounted equipment.

☆ ☆ ☆



The Model HIP-600 is an open type power unit incorporating the same basic engine as that described above. It has a 4⅞" bore and 6" stroke, the six-cylinder unit having a piston displacement of 672 cu. in., and the four-cylinder, 448 cu. in.

☆ ☆ ☆

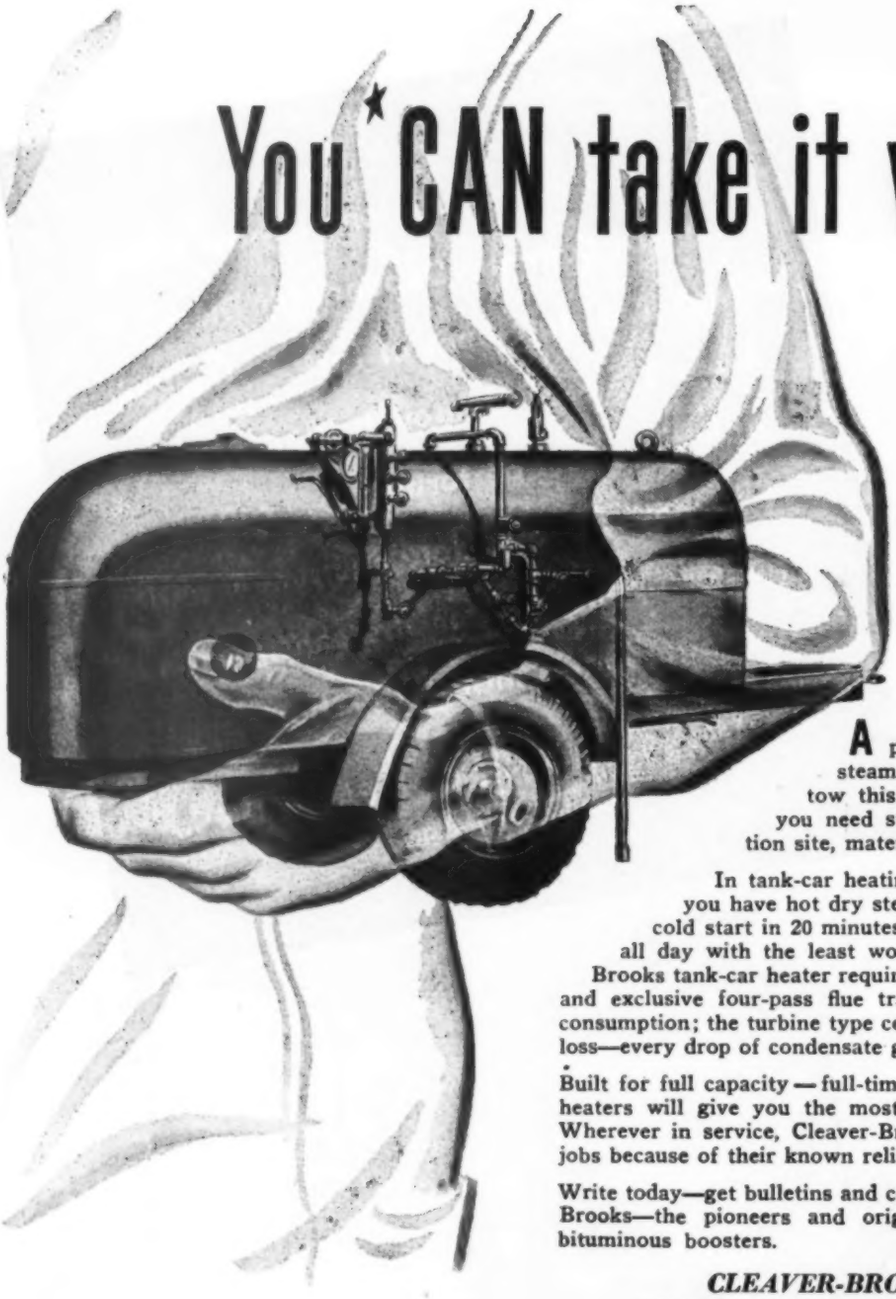


The Model HGA-601 is an AC generating set, rated 50 kw. at 1200 rpm. The four-cylinder Model H generating set is rated 30 kw. at 1200 rpm. Both four and six-cylinder sets are also available for DC operations.

"The job you want done is now being done by Cummins Dependable Diesels." That is a statement of fact . . . backed by a 12-year demonstration of reliable, low-cost performance . . . covering all types of heavy-duty equipment and power applications in the construction and aggregates industries — bar none!

CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana

You* CAN take it with you..



wherever you need *Steam!*

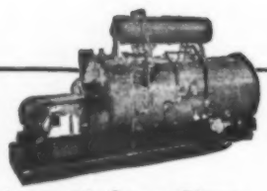
A perfected, highly efficient portable steam generator — on wheels — you can tow this unit with car or truck anywhere you need steam — tank-car siding, construction site, material yard or other location.

In tank-car heating with the Cleaver-Brooks heater you have hot dry steam flowing to the car coils from a cold start in 20 minutes or less. And you can keep going all day with the least work and bother because a Cleaver-Brooks tank-car heater requires less fuel and water. The famous and exclusive four-pass flue travel construction means low fuel consumption; the turbine type condensate return system cuts water loss—every drop of condensate goes back to heater under pressure.

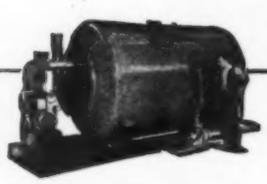
Built for full capacity — full-time work — Cleaver-Brooks tank-car heaters will give you the most in production hours on the job. Wherever in service, Cleaver-Brooks are usually given the tough jobs because of their known reliability.

Write today—get bulletins and complete information from Cleaver-Brooks—the pioneers and originators of tank-car heaters and bituminous boosters.

CLEAVER-BROOKS COMPANY
5106 N. 33rd Street • Milwaukee 9, Wisconsin



Automatic Steam Plants
Completely self contained; highly efficient; require only simple piping connections to place in operation. Fully automatic fuel-oil burner; condensate recovery and feed water pumping system; no stack needed, sizes from 20 to 500 h.p.; pressures 15 to 200 lbs.



Hot Water Boosters
Oil-fired; fully automatic or manual operation; no licensed engineer needed; two capacity sizes: 3000 gals. storage tank for 1600 gals. of water heated 150° F. per hour; 1500 gals. storage tank for 800 gals. of water heated 150° F. per hour.

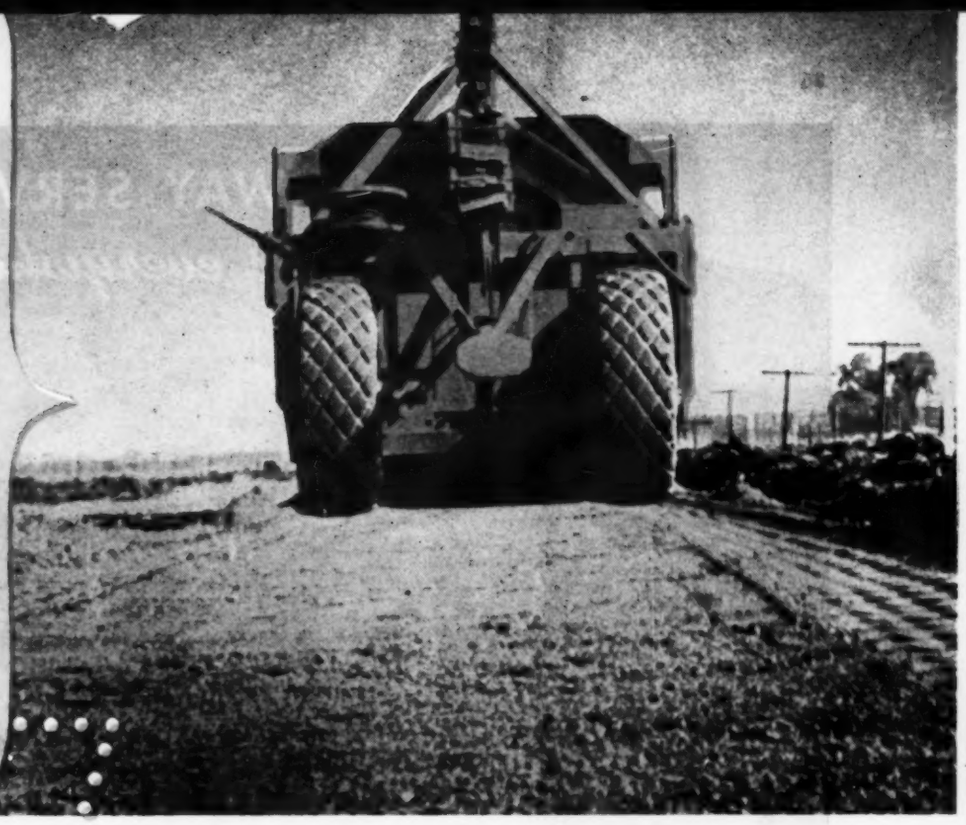
Portable Pumping Boosters
Heats bituminous material by direct firing in one operation, loading directly to distributor, relay truck or returning to tank car. Two sizes, truck mounting or 4-wheel trailer.

Portable Tank-Car Heaters
Available in 2 and 3 tank-car sizes. Oil-fired with exclusive four-pass flue travel; dry-coil steam condensate return under pressure — no water or heat loss. Provides a portable source of steam wherever needed.

Cleaver-Brooks

Pioneers and Originators of *TANK CAR HEATERS *BITUMINOUS BOOSTERS *AUTOMATIC STEAM-PLANTS

Sub-Base Gravel LOADED HAULED SPREAD in place.....



Loading gravel for sub-base from roadside pit.

Both dirt and gravel hauled over existing pavement.

with TOURNAPULLS

With their 400,000 cu. yd. of grading 13 miles on U.S. 66, near Chenoa, Illinois, Raemisch-Madden Co. also took 47,000 cu. yds. of gravel sub-base to be placed with their Tournapulls.

Wet pit-run gravel was pusher loaded by Tournapulls in about 2 minutes, taking extra time to pack in capacity loads because of long hauls. Loads averaged 12½ to 13 pay yards. Tournapulls traveled 800' from pit to road, then 3 miles via old pavement to sub-base. Gravel was spread accurately in 4 to 6" lifts in a prepared earth form. Each load covered a section 11' wide, 75 to 100' long. Average spreading time — ½ minute.

25 PAY YDS. PER HOUR ON 6-MILE ROUND TRIPS

Each Tournapull completed one 6-mile cycle every 30 minutes, averaged 25 pay yards loaded, hauled and spread in place per hour. Using Tournapulls, Raemisch-Madden eliminated need for (1) conventional shovel loading, (2) small capacity truck hauling and (3) spreader boxes or dozer spreading. Rigid standards were met with two state inspectors continually on the fill.

SAME FAST-MOVING RIGS ALSO HANDLE RAEMISCH-MADDEN'S MAJOR DIRTMOVING SECTION

On Raemisch-Madden's 400,000 cu. yd. grading section, 11 Tournapulls averaged 10 pay yard loads in wet, spongy dirt. On 7800-foot round trips, average cycle time was 10.9 minutes, each Tournapull completed 5½ trips per hour . . . delivered 55 pay yards per 50-minute hour.

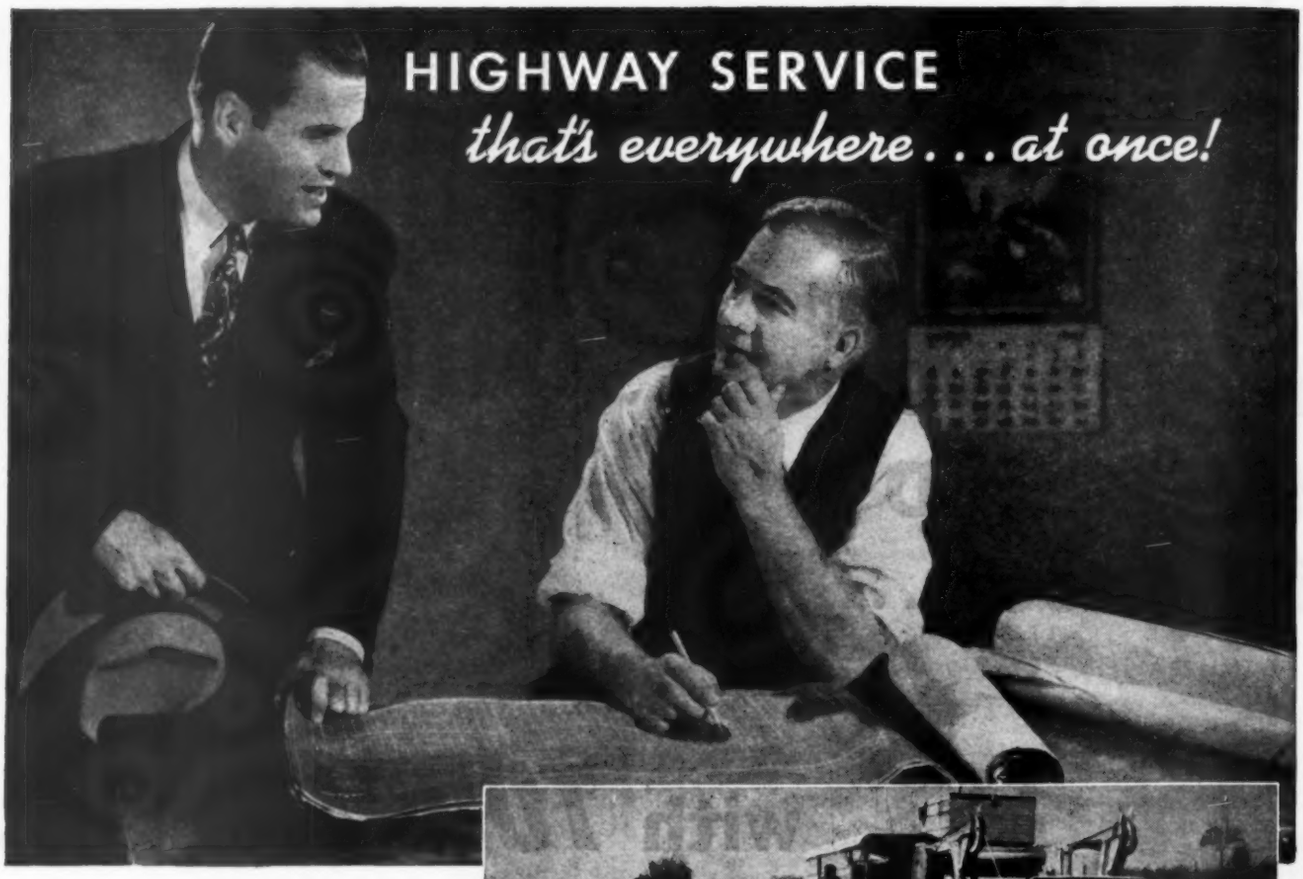
Summing up his Tournapull operation in both dirt and gravel, Contractor Raemisch says, " . . . You move more dirt faster . . . that's my profit . . . so we're all for it". You, too, can increase your profits with high speed, versatile Tournapulls. Your LeTourneau distributor can give you full information on methods, job planning, priorities and deliveries. See him TODAY. caa

LETOURNEAU

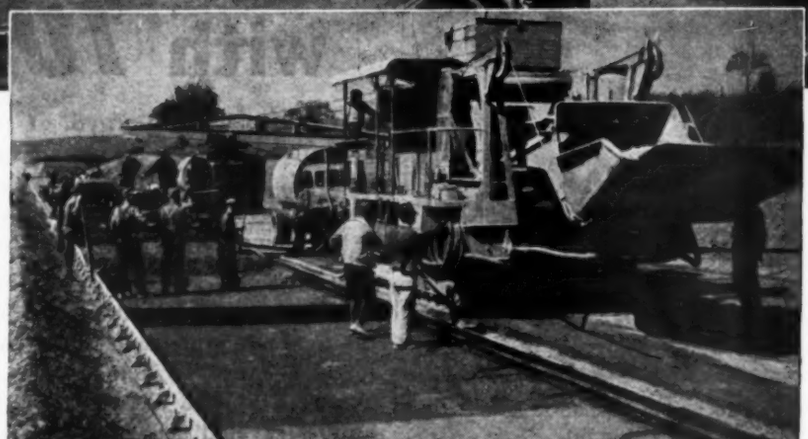
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

Manufacturers of Tournapulls*, Angledozers*, Bulldozers, Tiltdozers*, Carryall* Scrapers, Power Control Units, Rooters*, Tournatrailers; Tournacranes*, Tournatrucks*, Sheep's Foot Rollers, Tournarope*, Tournaweld*, Tournalifts*. *Trade Mark Reg. U.S. Pat. Off.

FOR LOWEST NET COST PER YARD



"YES SIR . . . 22 CECO OFFICES strategically located give speedy service to road builders everywhere!"



Nation wide service from 22 offices. That's only one advantage of the Ceco Highway Products Division service to road builders. Here's another . . . by specifying Ceco you can take care of your Highway product needs in one order, for Ceco provides a complete speedy service.

And remember, Ceco is the country's largest independent fabricator of bars . . . and that means experience in steel fabrication. Yes sir, when you specify Ceco you can be certain you're getting what it takes to do a better job, faster! Be sure to check the list of Ceco Highway Division products, then write for details. Do it now, well in advance of your post war construction!

Here ROADBUILDERS, is your Check List of CECO Highway Products . . .

1. Reinforcing steel
2. Welded fabric
3. Expansion and contraction joint: asphalt or fibre
4. Metal centerstrips
5. Load transmission devices
6. Cecure curing compound
7. Dowel bar supports, dowel sockets, stake pins
8. Subgrade paper

CECO STEEL PRODUCTS CORPORATION

Highway Products Division—5701 W. 26th St., Chicago, Ill.

Manufacturing Division, Concrete Engineering Division, Sheet Steel and Wire Division

ENGINEERING MAKES THE BIG DIFFERENCE IN **CECO** CONSTRUCTION PRODUCTS

To OFFSET an OFF-CENTER Load!

• To offset the effects of an off-center load . . . to keep the load pushing straight ahead, without whipping or jerking, Oliver "Cletrac" offers you *controlled differential steering.*

On an Oliver "Cletrac" tractor, the pull of one track is balanced against the pull of the other. The relative speeds of the tracks may be changed to offset the side pull of an off-center load. Power is never completely disconnected from either track at any time . . . *even on turns.*

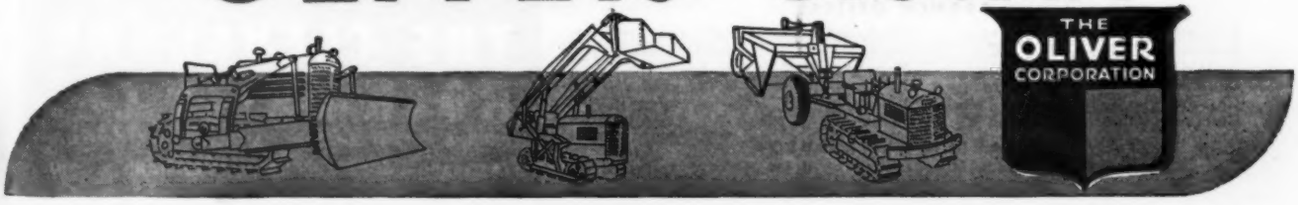
Bulldozing, trailbuilding or grading, the *controlled differential steering* of Oliver "Cletrac" tractors means added safety. They are always under perfect control . . . on hills or levels. And they steer the same going downhill or up! There's no need to "declutch" or "brake" when turning.

Ruggedly built for long, dependable service, Oliver "Cletrac" tractors are designed to withstand the shocks, strains and twists of construction service. Their unusual accessibility makes maintenance a simple task.

Substantial numbers of Oliver "Cletracs" are now being released for essential use. Your Oliver "Cletrac" dealer will gladly assist you in making application for a new tractor.

The OLIVER Corporation, Industrial Division: 19300 Euclid Avenue, Cleveland, Ohio.

OLIVER - Cletrac



Tough Terrain!

But NOT too tough for CLEVELAND Wagon Drills!

● The mountain side is so steep on this road-building job that the wagon drills must be held with ropes. Yet even under such difficult conditions the Cleveland DR30 proves its mettle.

As this picture indicates, the DR30 is unsurpassed in maneuverability. The machine drills at *any* angle and in *any* direction—flat holes from 4" to 8' above ground—also straight up or down. Feed travel is over 8', permitting 6-foot steel changes, and the machine handles depths to 25' or more. The DR30 has a double screw U-bar jack, a recoil device to increase cutting speed, an improved centralizer, and a forward leg point to steady the drill. All these features make the Cleveland DR30 the most popular wagon drill ever built.

ASK FOR BULLETIN 132

Pneumatic tires now obtainable if specified by purchaser in his application for priority to Construction Machinery Branch of War Production Board.

SPEED FINAL VICTORY!
BUY MORE WAR BONDS

LEADERS IN DRILLING EQUIPMENT

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Birmingham, Ala.	Dallas, Texas	Los Angeles, Calif.	Salt Lake City, Utah
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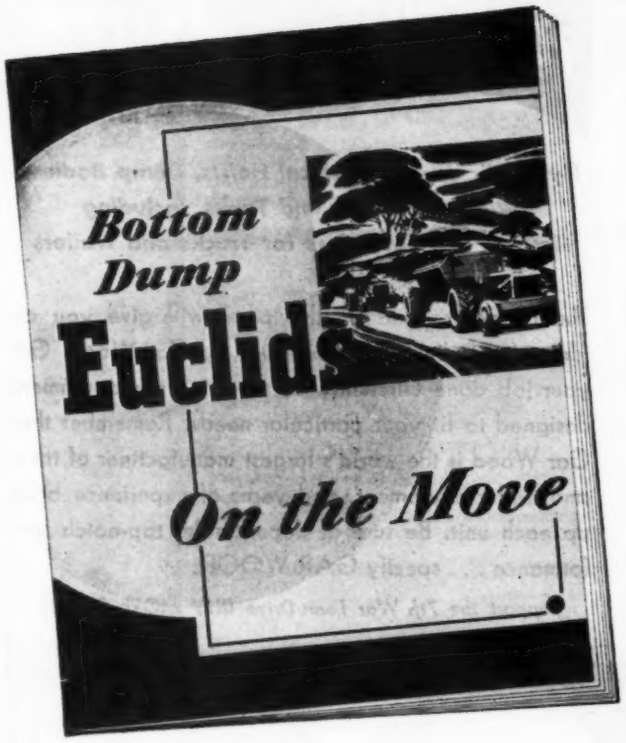
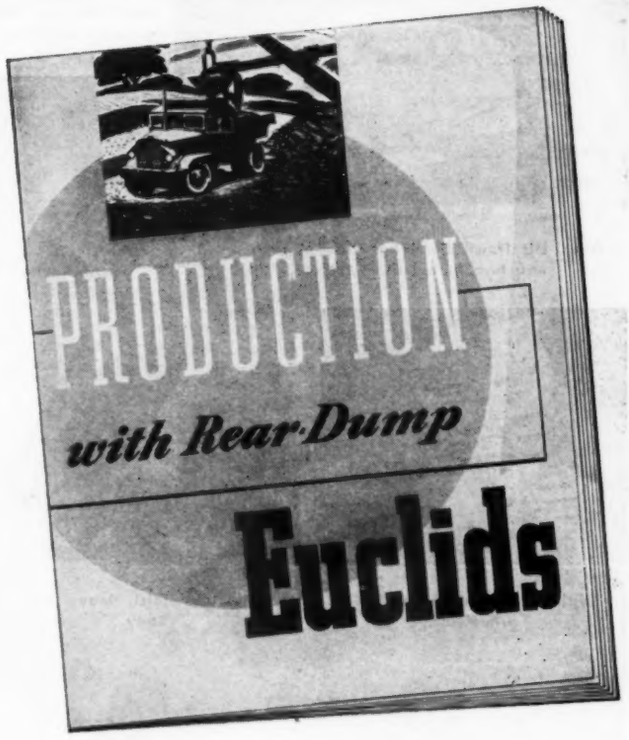
THE CLEVELAND ROCK DRILL CO.
DIVISION OF THE CLEVELAND PNEUMATIC TOOL COMPANY
CABLE ADDRESS: "ROCKDRILL" • CLEVELAND 5, OHIO

Have you received yours?

These interesting and helpful books are YOURS FOR THE ASKING





If you use off-the-highway hauling equipment of any kind, you'll want copies of these two new books. Each contains a large number of illustrations and descriptions of mining, construction and quarry jobs on which Euclids have helped to increase production and cut costs on all lengths of haul.

A note on your letterhead will bring your copies of these books promptly, along with any information on Rear-Dump and Bottom-Dump EUCLIDS that you would like to have. Your request can be addressed to the nearest Euclid Distributor or to us direct, as you prefer.

The EUCLID ROAD MACHINERY Co. · · · Cleveland 17, Ohio

EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH ROCK COAL ORE

GAR WOOD TRUCK EQUIPMENT

FOR YOUR SPECIALIZED JOB

GAR WOOD INDUSTRIES, INC. GW TRADE MARK

Cam and Roller Hoist for long wheelbase chassis. High ground clearance for piling.

Direct-Lift Hoist. Body has trussed understructure, an exclusive feature.

Hydraulic and Mechanical Hoists, Dump Bodies, Winches, Cranes and Tanks, Including Flushers and Sprinklers for Trucks and Trailers

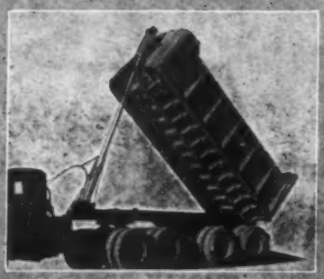
The units described on this page will give you an idea of the diversified line built by Gar Wood. Get your job done efficiently by selecting the equipment designed to fit your particular needs. Remember that Gar Wood is the world's largest manufacturer of truck and trailer equipment, and years of experience back up each unit. Be sure of dependable, top-notch performance . . . specify GAR WOOD.

Support the 7th War Loan Drive BUY MORE BONDS

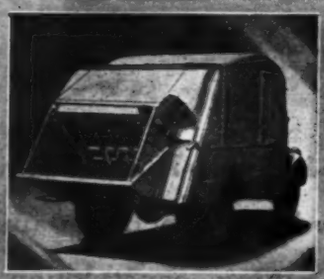
Typical installation for Six-wheelers.

Telescopic Hoist. Heavy-Duty Body.

Dual Telescopic Hoist and Rock Body. Down-folding gate.



Vertical Telescopic Hoist for long bodies.



Load-Packer. Compresses garbage and rubbish. Greater loads—fewer trucks and men required.

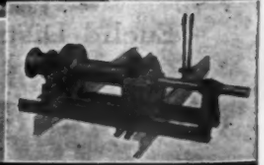
Tree-Moving Crane picks up, transports and re-sets trees.

Hydraulic Repair Tower.

Tanks for all types of liquids.

Street Flushers and Sprinklers.

Cranes. All types and sizes for handling pipes, machinery, etc.



Utility Winches in both single or double drum types.

Branches and Distributors in All Principal Cities

GAR WOOD INDUSTRIES, INC.

DETROIT 11, MICHIGAN

World's Largest Manufacturers of Truck and Trailer Equipment

HOISTS AND BODIES • WINCHES AND CRANES • TANKS • ROAD MACHINERY • HEATING EQUIPMENT • MOTOR BOATS

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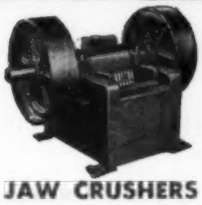
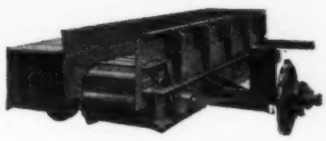
ROCK, ORE and GRAVEL CRUSHING · SCREENING · WASHING · HANDLING

Plants and Equipment



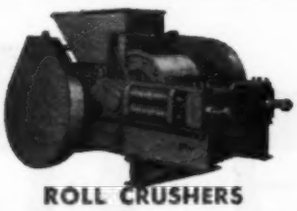
JAW CRUSHERS

Overhead eccentric type for primary crushing. Will handle large material, has downward and forward crushing action. Sturdy design for high tonnage capacity.



FEEDERS

Regulate flow of material to crushers to assure continuous high production. Medium and heavy duty types, horizontal or inclined; will bypass undersize.



ROLL CRUSHERS

For secondary crushing and fine reduction. Star gears driven by belt and countershaft; manganese shells and anti-friction bearings. Delivers large tonnage, accurately sized.

VIBRATOR SCREENS

Positive, uniform agitation. Circular motion for fast, accurate screening. Perfectly balanced, 4 SKF bearings for smooth operation; long life. Sagless, replaceable screens.

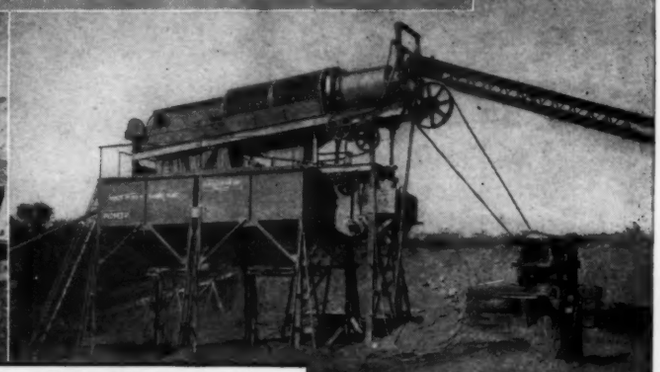
BELT CONVEYORS AND ACCESSORIES

Standard sectional, knock-down type, welded lattice frame reinforced. Plain or anti-friction bearings. Straight or troughing idlers; supports and belt tighteners.

REVOLVING SCREENS

Portable or stationary types, adapted for scalping, washing, scrubbing and sizing, also for dehydrating. Available with spray pipes, conveyors, sand jacket, bins.

Have primary and secondary crushers, screen and conveyor. Produce aggregate for road surfacing and other construction. Available in 5 sizes, capacities to 300 t.p.h. Washing and dehydrating equipment optional.



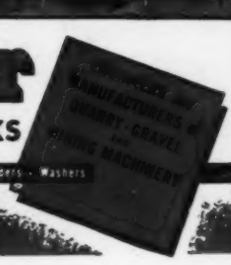
Portable Washing Plants

Washes, screens and dehydrates to produce sand and several sizes of aggregate. Crusher optional. Pioneer also builds portable and stationary quarry plants, as well as travel-mix and central mix bituminous plants.

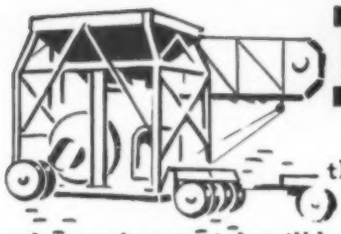
Pioneer

ENGINEERING WORKS

Jaw Crushers · Roll Crushers · Screens · Conveyors · Feeders · Washers



MINNEAPOLIS 13, MINN



LOOK AHEAD with Erie Steel to the post war demand for specification concrete delivered to the job at rock bottom cost ★ We introduced the Strayer *Portable* Concrete Plant a few years before the war and with the release of materials will be ready with the smoothest operating unit that will provide a fast loading, storage, batching, weighing and mixing concrete unit that will give you up to 40 yards per hour of highest grade concrete at the job ★ General and Road contractors will find it the answer to highway culverts retaining walls, small bridges, buildings, housing and many other concrete uses ★ Plan ahead . . . get the facts on the performance of the Strayer Portable Concrete Plant ★

Write today for the complete details to

ERIE STEEL CONSTRUCTION CO.

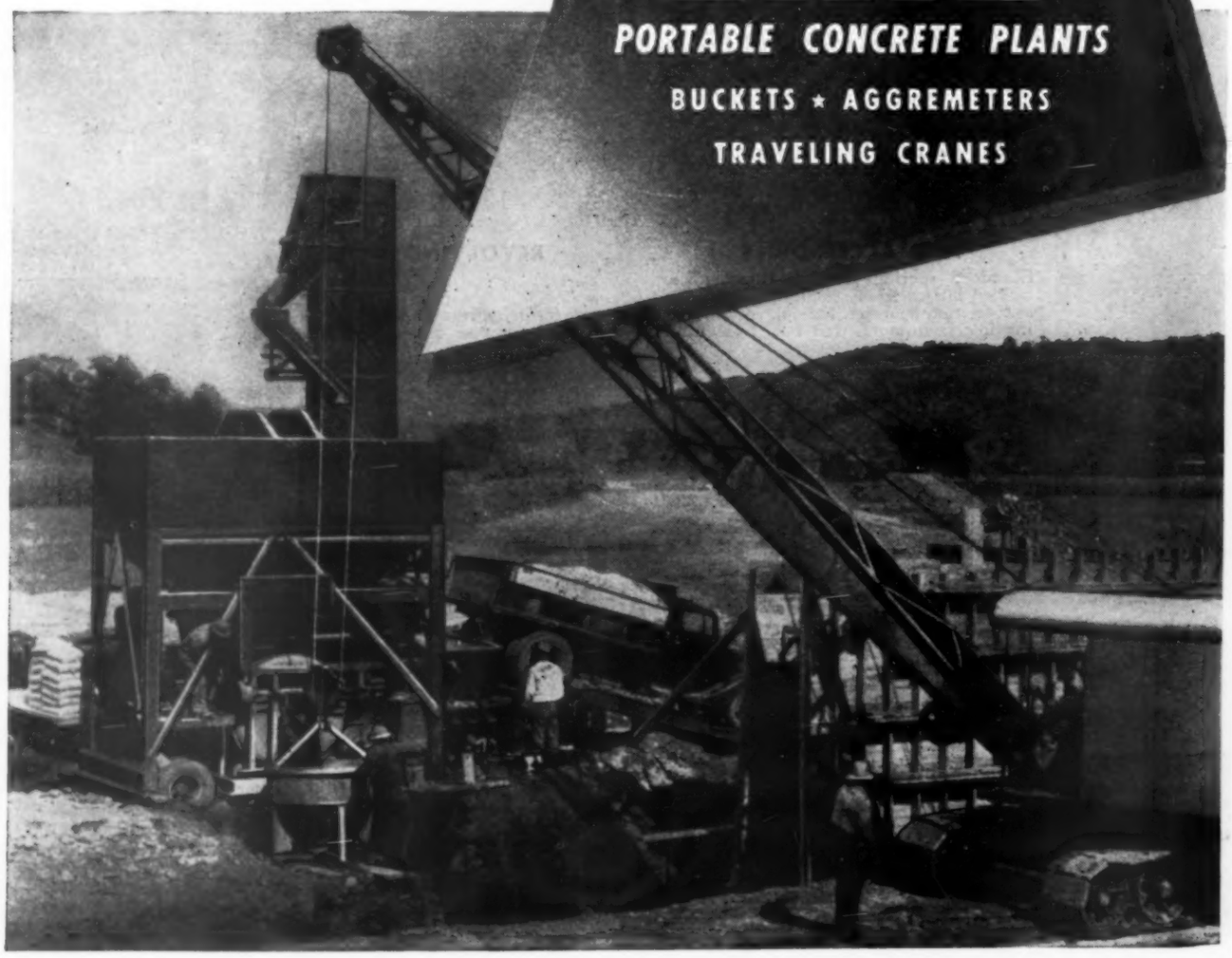
355 GEIST ROAD ★ ERIE, PA.

ERIE

PORTABLE CONCRETE PLANTS

BUCKETS ★ AGGREMETERS

TRAVELING CRANES



NO DANGER OF "JACKNIFING!"

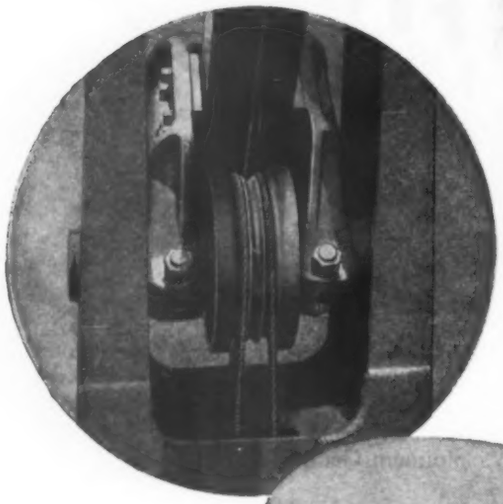
As there are no steering clutches to "fight" nor individual brakes to "humor" or grab, the true directional steering of a Wooldridge Terra-Cobra eliminates any chance for *"Jacknifing"* to occur with resultant costly accidents, damage and down-time. Power is maintained on both wheels simultaneously. The front drive wheels both turn under power with their respective speeds automatically governed by differential gears in exactly the same manner as heavy duty trucks. Operators are able to maintain higher hourly yardage averages as fatigue is reduced to a minimum. Get the full facts today.

Send for Bulletin TA-425

WOOLDRIDGE MANUFACTURING CO.
SUNNYVALE, CALIFORNIA

WOOLDRIDGE TERRA COBRA
SELF-PROPELLED EARTHMOVERS

SECONDS SAVED MEAN OUTPUT Gained



Balanced with hoist and swing to save vital seconds on every cycle, the Bucyrus-Erie rope crowd produces the kind of digging action that means more yardage. Whether the dipper is in close or extended to full reach and lift, whether it's empty or full, the operator has complete, positive control. Crowding and retracting are independent of all other functions, can be handled with regular rhythm for big output in shallow grading or in high speed loading — another factor in the outstanding performance record of ⅜-, ½-, and ¾-yard Bucyrus-Eries at the "fronts" and at home. And because the twin rope crowd eliminates many wearing parts, weight is kept down, maintenance reduced. Field conversion to crane-type front ends is easier, too, because the crowd drum is attached to the boom and comes off with it.

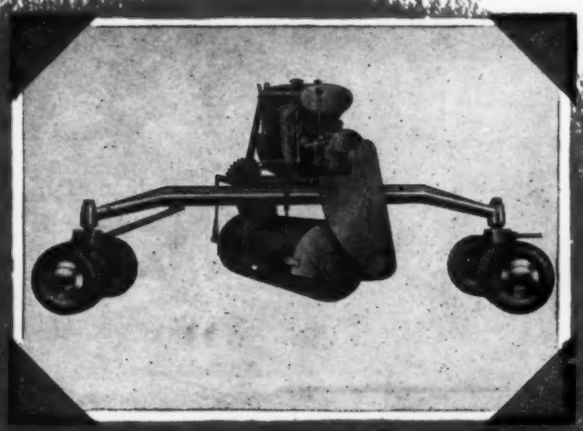
11E45

Positive independent twin-rope crowd does a lot to make Bucyrus-Eries tops in output. But there are plenty of other reasons, too. The full Bucyrus-Erie performance story will convince you.

So. Milwaukee **BUCYRUS ERIE** Wisconsin

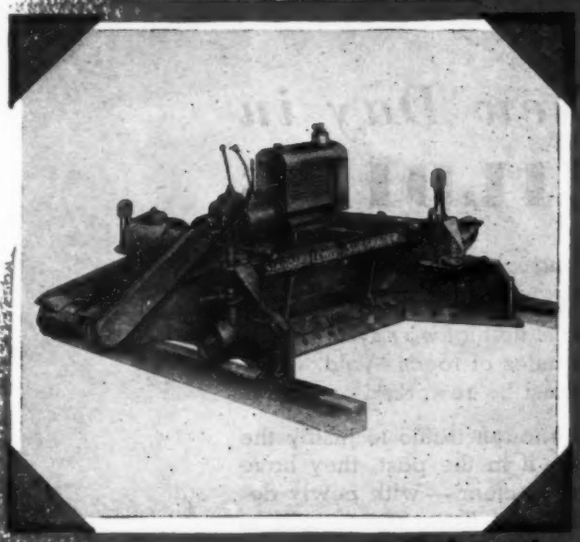
STANDARD
—A COMPLETE LINE

for Post War Construction

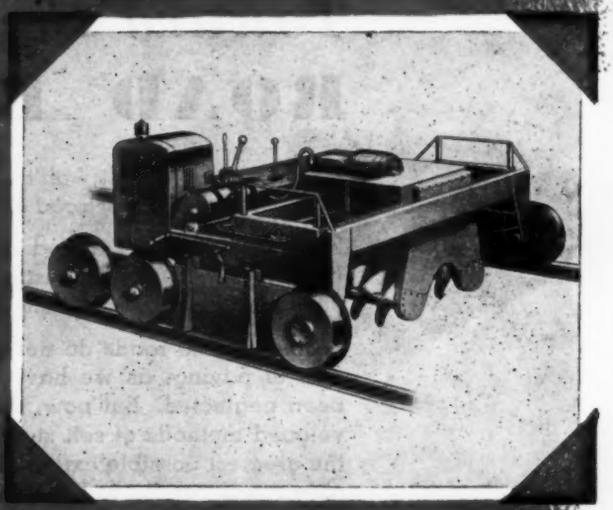


Power Broom

Spreader

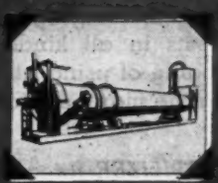


Subgrader



Concrete Finisher

Asphalt Plant



Dryer

Roller

Batching Plant

Here at Standard Steel we are working "around the clock" on war production. Nevertheless, we believe it a patriotic duty, as well as a practical necessity, to plan now for tomorrow. Postwar demands in the construction field will call for modern and effective equipment. An engineering background of more than twenty years experience in the paving equipment field is evident throughout the entire design in the Standard Steel line. Contractors are thus assured efficiency and sturdiness which mean greater profits. The *complete* line enables Standard's distributors to offer *complete* service to paving contractors. *Write for Bulletins S2 and S5.*

BUY WAR BONDS...AND KEEP THEM

STANDARD
STEEL CORPORATION

General Offices and Plant: 5001 South Boyle Avenue
Los Angeles 11, California

Toward the New Day in ROAD BUILDING

● Someday — and it won't wait long when the war is over — a tremendous job of road building will start in this country.

Beyond the network of Federal and state highway systems, are literally hundreds of thousands of miles of roads — old, worn-out roads of all descriptions that must be reworked or rebuilt.

Because these roads do not carry enough traffic to justify the cost of paving, as we have known it in the past, they have been neglected. But now, the way is clear — with newly developed methods of soil stabilization. By using native soils to the greatest possible extent, the cost of building highly serviceable roads can be reduced substantially.

Foreseeing the need for modern equipment to go hand in hand with the developments in soil stabilization, P&H engineers have been at work. Through the stages of design, development, and exhaustive tests in all kinds of soils, they have produced a machine capable of using all types of commercial admixtures, and reducing the many operations in soil preparation to a single pass.

The P&H *Single Pass STABILIZER* forecasts a new era in the building of good all-weather roads at lower cost than has ever been known. If you have such projects in mind, it is not too early to investigate.

P&H HARNISCHFEGER CORPORATION

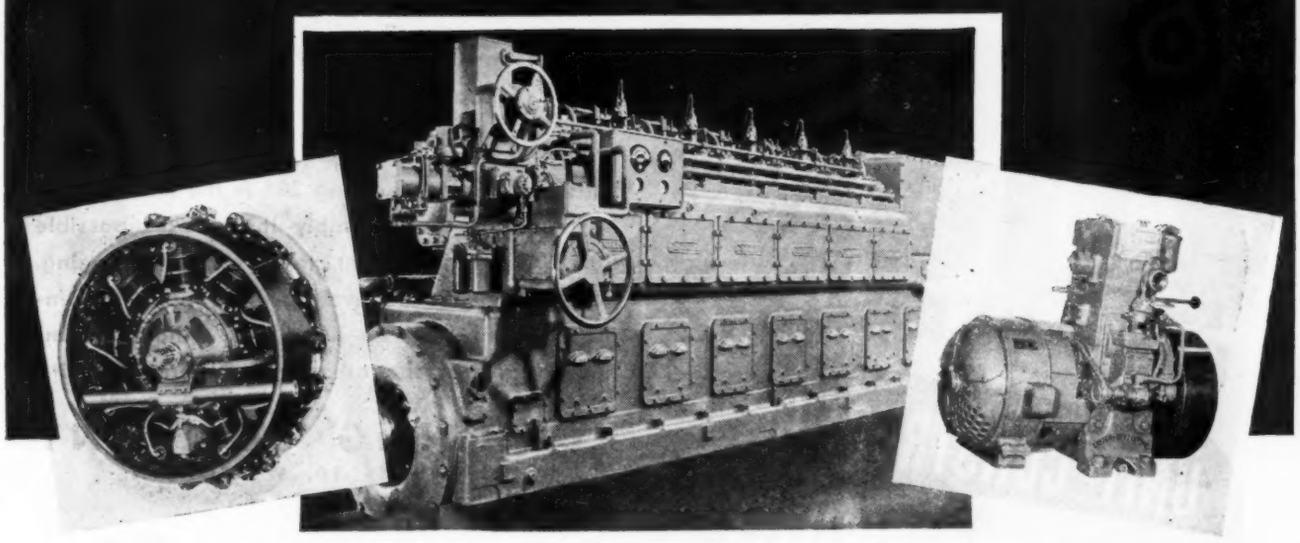
EXCAVATORS · ELECTRIC CRANES · ARC WELDERS · HOISTS · WELDING ELECTRODES · MOTORS

SINGLE PASS STABILIZERS

4496 West National Avenue,
Milwaukee 14, Wisconsin

PORUS-KROME

undercover. . but unequaled



PORUS-KROME has nothing to hide . . . even though it is always undercover and out of sight. Its records for increasing the life of cylinders and liners are still unequaled, and the results are comparable in every type of heavy-duty engine . . . big marine Diesel, radial aircraft engine, or even small auxiliary power plants.

PORUS-KROME is hard, pure chromium which is applied to cylinder bores by the Van der Horst process. It has tiny pores and channels in its surface which serve as reservoirs for lubricating oil, feeding it back as needed. It reduces corrosion and wear, and multiplies cylinder life 4 to 20 times . . . ring life 3 to 5 times.

Although the Army and Navy now absorb the entire production of its three plants, Van der Horst is eager to plan with engine manufacturers for postwar use of PORUS-KROME. Write today for full information about the advantages of greater reliability and lower maintenance cost that PORUS-KROME will give to your engines.

PORUS - KROME

Good for the Life of your Engines

VAN DER HORST

U. S. PATENTS 2,048,578 AND 2,314,604

VAN DER HORST CORPORATION OF AMERICA

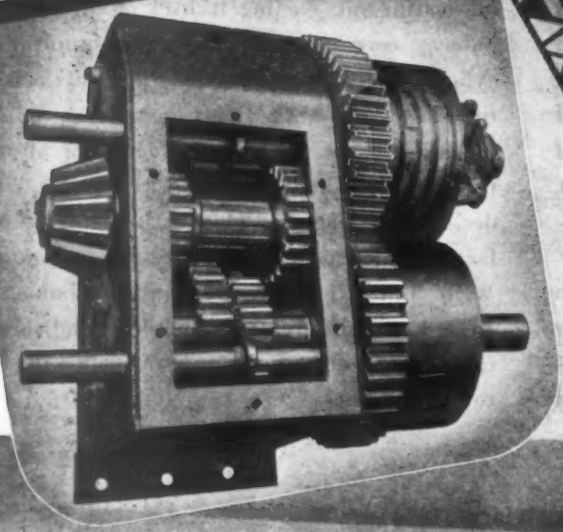
AN AFFILIATE OF DRESSER INDUSTRIES

OLEAN • NEW YORK
CLEVELAND 11 • OHIO

MAJOR ASSEMBLIES QUICKLY REMOVABLE

205 HALF-YARD

UNIT CONSTRUCTION FOR EASY ACCESSIBILITY



● Major machinery units on the new Koehring 205 are quickly and easily removed. No need to disconnect other assemblies when only the drumshaft, or the boom hoist, or the traction gear case, needs attention. Lift out only the part you want for convenient bench work. For major overhauls, the entire machinery support frame lifts off . . . as a unit . . . with all the machinery that's attached to it.

Typical of the quickly removable major machinery units of the new Koehring 205 is the independent traction unit, the assembly that makes possible the 205's independent travel while swinging, hoisting, raising or lowering the boom. The entire assembly can be lifted out without disconnecting any of the other main operating units.

KOEHRING COMPANY
MILWAUKEE 10, WISCONSIN

Orders Accepted Now for Postwar Delivery

KOEHRING HEAVY DUTY

ARMY E NAVY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Away On Vacation Back In November

Winter's gone—but it can't be forgotten! Worst in years, this past winter proved crippling to communities with inadequate snow removal equipment.

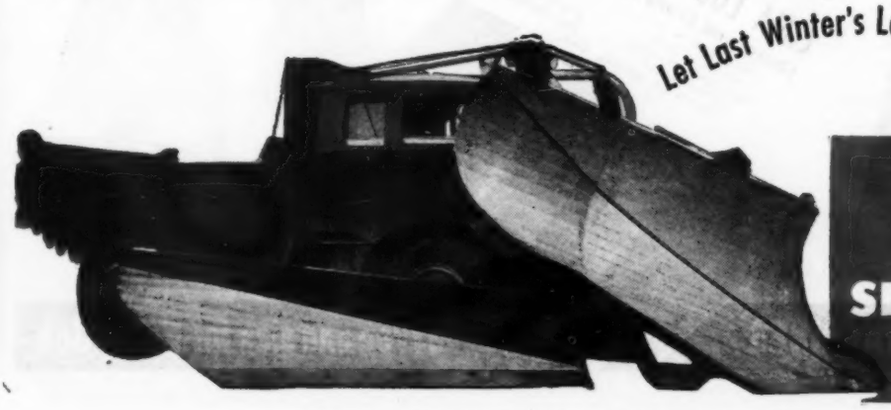
Remember—in six short months, winter returns. To be fully prepared in time, you've got to start right NOW—planning equipment needs and ordering early!

Make the right start by ordering the most outstanding of all snow removal equipment—Walter Snow Fighters . . . the trucks that do the "impossible" in snow clearance according to highway and airport officials. Specially engineered, and featuring the exclusive 4-Point Positive Drive, Walter Snow Fighters give you a combination of great power—traction—speed—and ruggedness found in no other truck.

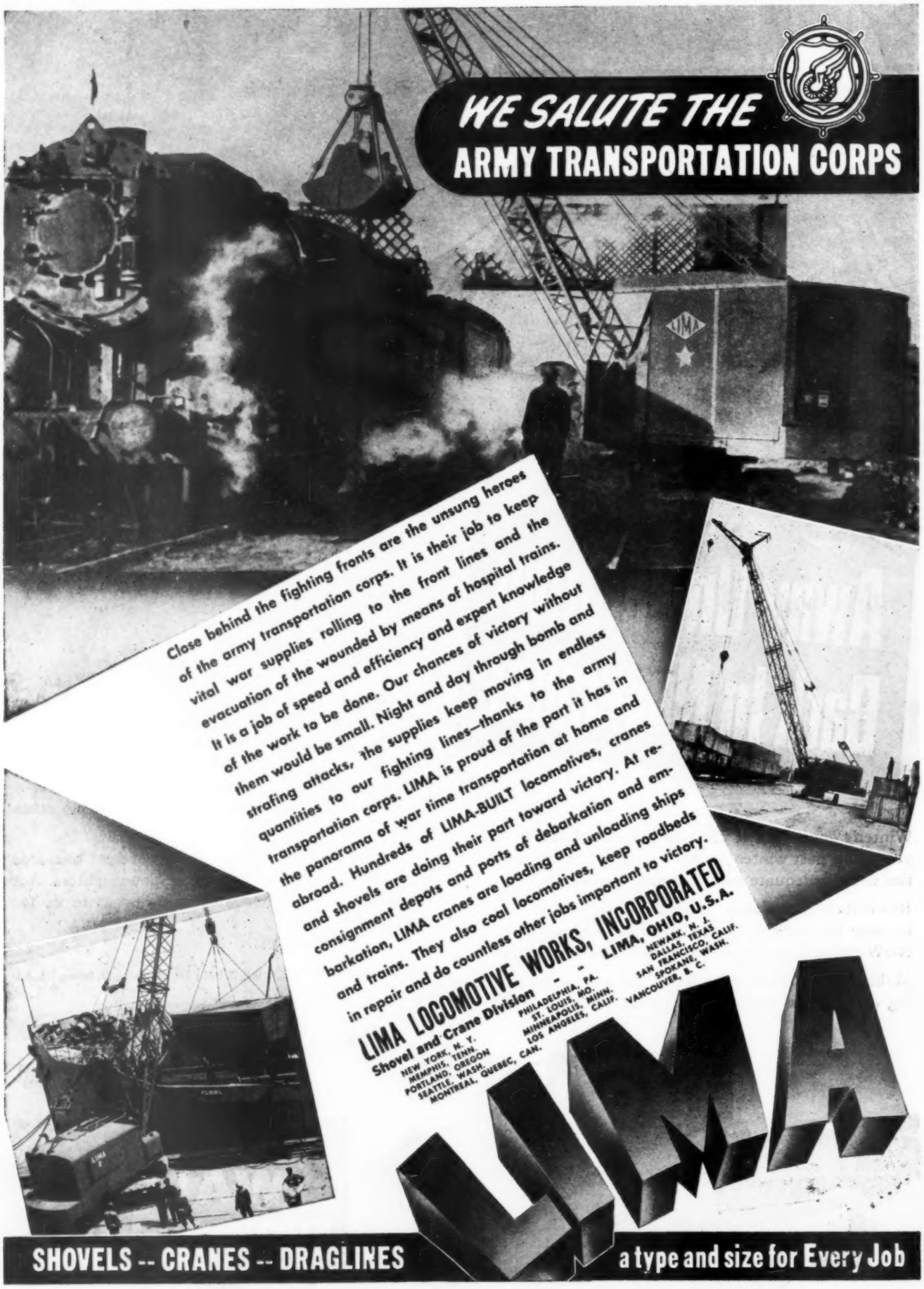
To keep your roads open in the severest blizzards next winter, equip with Walter Snow Fighters. Act now. See your Walter distributor or write us for detailed literature.

WALTER MOTOR TRUCK CO., 1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N.Y.

Let Last Winter's Lesson be Next Winter's Warning!



Order WALTER SNOW FIGHTERS Now!


WE SALUTE THE
ARMY TRANSPORTATION CORPS
Close behind the fighting fronts are the unsung heroes of the army transportation corps. It is their job to keep vital war supplies rolling to the front lines and the evacuation of the wounded by means of hospital trains. It is a job of speed and efficiency and expert knowledge of the work to be done. Our chances of victory without them would be small. Night and day through bomb and strafing attacks, the supplies keep moving in endless quantities to our fighting lines—thanks to the army transportation corps. LIMA is proud of the part it has in the panorama of war time transportation at home and abroad. Hundreds of LIMA-BUILT locomotives, cranes and shovels are doing their part toward victory. At re-consignment depots and ports of debarkation and em-barkation, LIMA cranes are loading and unloading ships and trains. They also coal locomotives, keep roadbeds in repair and do countless other jobs important to victory.
LIMA LOCOMOTIVE WORKS, INCORPORATED
Shovel and Crane Division
LIMA, OHIO, U.S.A.
NEW YORK, N. Y.
MEMPHIS, TENN.
PORTLAND, OREGON
SEATTLE, WASH.
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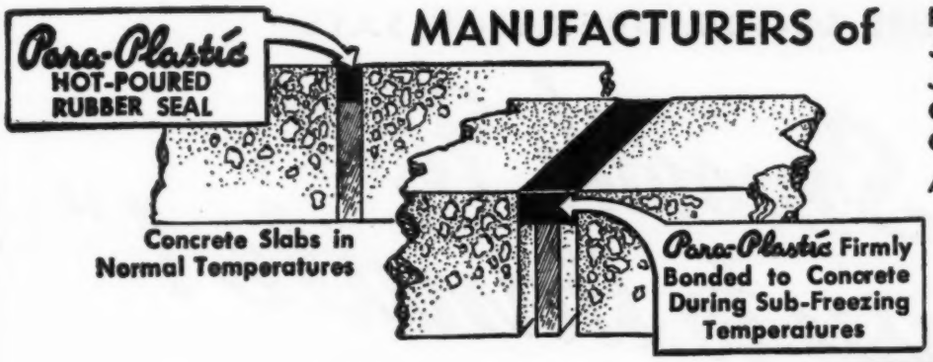
LIMA
SHOVELS -- CRANES -- DRAGLINES
a type and size for Every Job



MANUFACTURERS of

PREMOULDED EXPANSION JOINTS; FELT-SIDED ASPHALT JOINTS; SELF-EXPANDING CORK JOINTS; FELT SIDED AND CORK JOINTS; FIBER JOINTS...

ASPHALT PLANK for—
INDUSTRIAL FLOORING;
BRIDGES AND BY-PASSES,
RAILROAD TRACK FILLER,
ETC.; ETC.; ETC.

— Para-Plastic —
EXPANSION JOINT SEAL EXTENDABLE—MAINTAINS BOND at O° F.

HIGHWAY DRIVING IS A REAL PLEASURE ON CONCRETE ROADS

MADE SAFE and SMOOTH with Para-Plastic EXPANSION JOINTS

1.

2.

3.

THREE TESTS: PROVING PLIABILITY OF Para-Plastic IN COLD WEATHER

1 — PARA-PLASTIC Compound Frozen in Solid ICE.
2 — Still PLIABLE, easily BENT or TWISTED.
3 — In few Minutes—RESUMES Normal SHAPE.

SERVICISED QUALITY PRODUCTS © 1930

SERVICISED PRODUCTS CORP.
6051 West 65th Street, Chicago, Ill.

—SPEAKING OF HIS LS-100, OPERATOR SAYS—

"She's Smooth, Fast, Easy to Handle!"

. . . "and she's got lots of guts!" Purchased in 1940, this Link-Belt Speeder 1-yard shovel has scarcely had a day off, and has never lost a day because of trouble. After much important work in and around Schenectady, N. Y., handling 1,300 yards in an 8-hour day with ease, the top-soil loading job pictured here seemed like a vacation, the first in 5 years. Dependable and versatile, this Link-Belt Speeder upholds its family's reputation, and earns good dividends for its owner.

For Prompt, Efficient, Convenient Sales and Service: There is a Link-Belt Speeder Distributor Located Near You

9927

LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

How RPM DELO Oil reduces engine wear

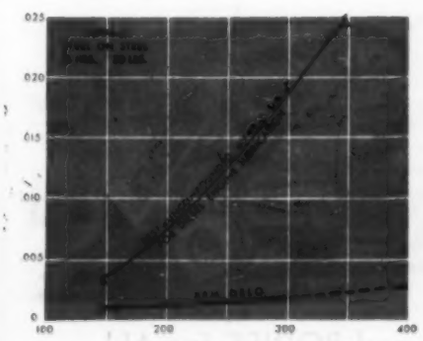
NEW PISTON RING

SCRATCHING WITH UNCOMPOUNDED MINERAL OIL

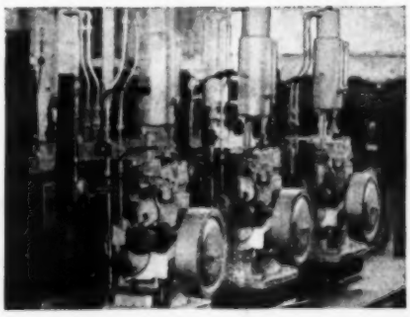
RING USED WITH RPM DELO OIL

The actual photographs above, in which the lines are merely emphasized by printing in red, are typical of the results obtained when testing RPM DELO Diesel Engine Lubricating Oil against ordinary Diesel oils. Because RPM DELO Oil contains a patented metal-adhering compound, it clings to hot cylinder spots that other oils leave dry, protecting rings and liners against excessive wear.

Here is a piston used in a special break-in test with straight mineral oil. This actual photo, with scratches emphasized in red, shows how rings, lands and skirt are badly scratched.



Confirming actual tests in engines are such laboratory tests as this with a Kinetic Oiliness Testing machine. RPM DELO Oil has far lower wear rate than the best uncompounded oil.



Here is a battery of special test engines in California Research Corporation's laboratories. They are used to determine the anti-ring-sticking properties of oils.

This piston went through the same test as the one above—but with RPM DELO Oil. No scratching occurred and every ring is free. RPM DELO Oil's film prevents scratching and scoring.

Detergent compound to clean engine.

Anti-oxidant to prevent gum and sludge.

Wear-reducing compound.

STANDARD OF CALIFORNIA

RPM DELO Oil has world-wide distribution, marketed under following names: RPM DELO, Caltex RPM DELO, Kyso RPM DELO, Signal RPM DELO, Sohio RPM DELO, Imperial RPM DELO (CONCENTRATE)

For more technical information about this revolutionary Diesel Engine lubricating oil, write to Standard of California, 225 Bush St., San Francisco 20, California, or California Commercial Co., 30 Rockefeller Plaza, New York 20, N. Y.

HOW FLINK ONE MAN *Material Spreader* DOES BETTER JOB

Spreads forward or backward, in even layers, wet or dry materials, thick or thin, as desired. Spreads full or half width of street. Efficiently handles all materials up to 1". Built for tough road building and maintenance jobs, for ice control, for spreading lime.

Flink spreaders do a better job for definite reasons:

1. POSITIVE AGITATION by rugged, simple, finger type agitators.
2. ADJUSTABLE GATES, set before spreading, give accurate control of amount spread.
3. HI CARBON STEEL FANS scientifically placed and angled, thoroughly "mix" material dropping through gates, deposit it in even layers on spreading surface. No thick and thin spots.
4. ELECTRICALLY WELDED. The Flink spreader is a rugged piece of commercial equipment, built of steel, for hard use.
5. FASTER. Spreads at 12 to 20 miles an hour. Can be operated by driver from cab who can throw spreader in and out of action as truck is in motion.
6. NO HELPER. The Flink is self-feeding. No shoveler on back to "rest up" or "warm up".
7. DOES NOT LIMIT USE OF TRUCK. Truck can be dumped same as with regular end gate or spreader can be replaced by original end gate in 5 minutes.

Write for literature.

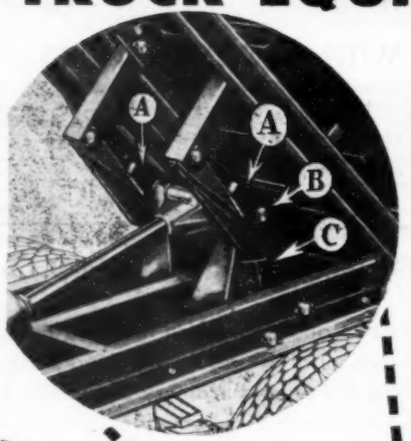
The FLINK COMPANY

508 VERMILION STREATOR, ILLINOIS

Why ANTHONY HYDRAULIC

REG. U.S. PAT. OFF.

TRUCK EQUIPMENT



Anthony Features of design and construction are the result of firsthand knowledge of job needs and customer requirements.

For example: This X-ray illustration shows the DOUBLE ARM "POWER SPEED" LIFT of the SUPER Hoist. Proved in the field through years of service. The steady, constant change in movement of piston and lift leverage compounds the power to give Anthony hoists a tremendous lift advantage at the beginning of the lift, when LOAD IS HEAVIEST, and increasingly faster action as body goes up and load lightens—notice too, the "RUBBER RESTRAINING BLOCKS" inside of links. These prevent "over-run and kick-back", and greatly simplify controlling the load when dumping or spreading materials.

HOISTS and BODIES for ALL
Motor Trucks • 6 Wheelers • Semi-Trailers

ANTHONY LIFT GATE HYDRAULIC

SOLVES A MANPOWER PROBLEM

ANTHONY COMPANY

STREATOR ILLINOIS

MARION
HAS THE ANSWER!

What is Your Material Handling Problem?

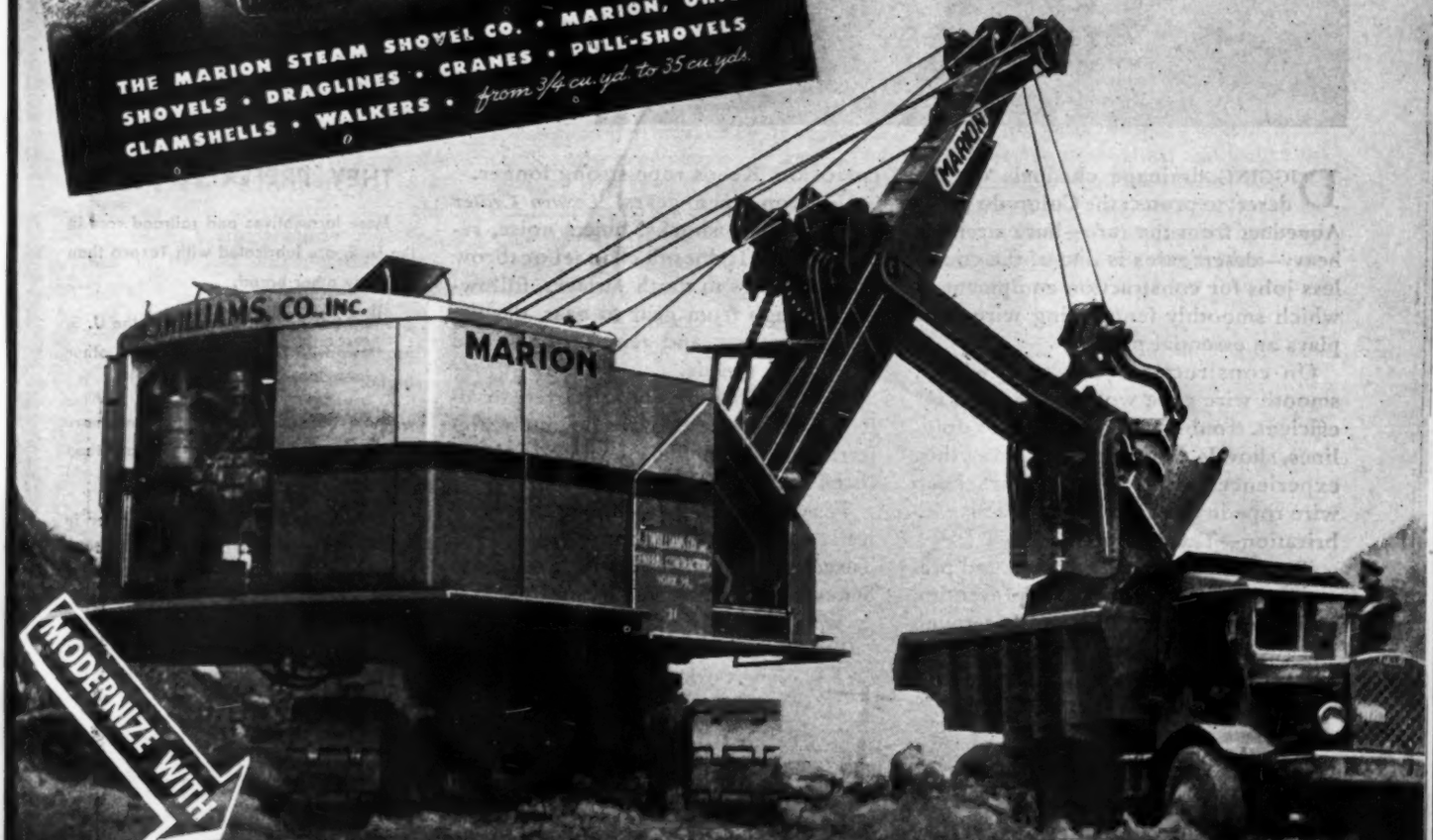
IS IT HIGHWAY CONSTRUCTION?

If it is, *MARION* has a modern machine, fast, powerful and of the right size for your job . . . . .

Construction will benefit materially from the billions of dollars now being set aside for post-war developments.

To meet the demand that will exist for proven equipment, MARION has a machine of the right size and type from ¾ cubic yard to 35 cubic yards. Put a fast, powerful MARION on that postwar job—then watch the rock and dirt fly! Let's discuss your problems!

THE MARION STEAM SHOVEL CO. • MARION, OHIO
SHOVELS • DRAGLINES • CRANES • PULL-SHOVELS
CLAMSHELLS • WALKERS • *from 3/4 cu. yd. to 35 cu. yds.*



MODERNIZE WITH

THE **MARION** STEAM SHOVEL COMPANY
Marion, Ohio
3/4 CU. YD. TO 35 CU. YDS.

SMOOTH *Rope work*

DIGGING drainage channels on the desert to protect the Colorado River Aqueduct from the rare—but extremely heavy—desert rains is one of the countless jobs for construction equipment in which smoothly functioning wire rope plays an essential part.

On construction jobs everywhere, smooth wire rope work is essential for efficient, trouble-free operation of draglines, shovels, hoists, etc. Knowing this, experienced contractors always keep wire rope in condition with effective lubrication—*Texaco Crater.*

Texaco Crater penetrates into and preserves the core of wire rope, preventing collapse. It seals each wire in a tough viscous film that reduces internal friction and wear, keeps out moisture, prevents corrosion. Keeps rope strong longer.

Used on open gears, *Texaco Crater* cushions load shocks, quiets noise, reduces wear. It doesn't channel or throw off, but clings to tooth surfaces, following through from gear to gear, despite high pressures and temperatures, and peripheral speeds.

Texaco lubricants have proved so effective in service they are definitely preferred in many fields, a few of which are listed at the right.

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FOR ALL CONTRACTORS' EQUIPMENT

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT—CBS

ROADS AND STREETS

May, 1945, Vol. 88, No. 5

Novel Methods Speed Texas Widening

Contractors are using both standard and special equipment to advantage in state's 500-mile 1945 concrete widening program

TO the motorists and truckers of Texas, the addition of 6 feet of width along 500 miles of heavily traveled 16 and 18-ft. concrete roads is good news indeed. It means greater safety at any speed and a big forward step in gearing older pavements and road designs to postwar traffic.

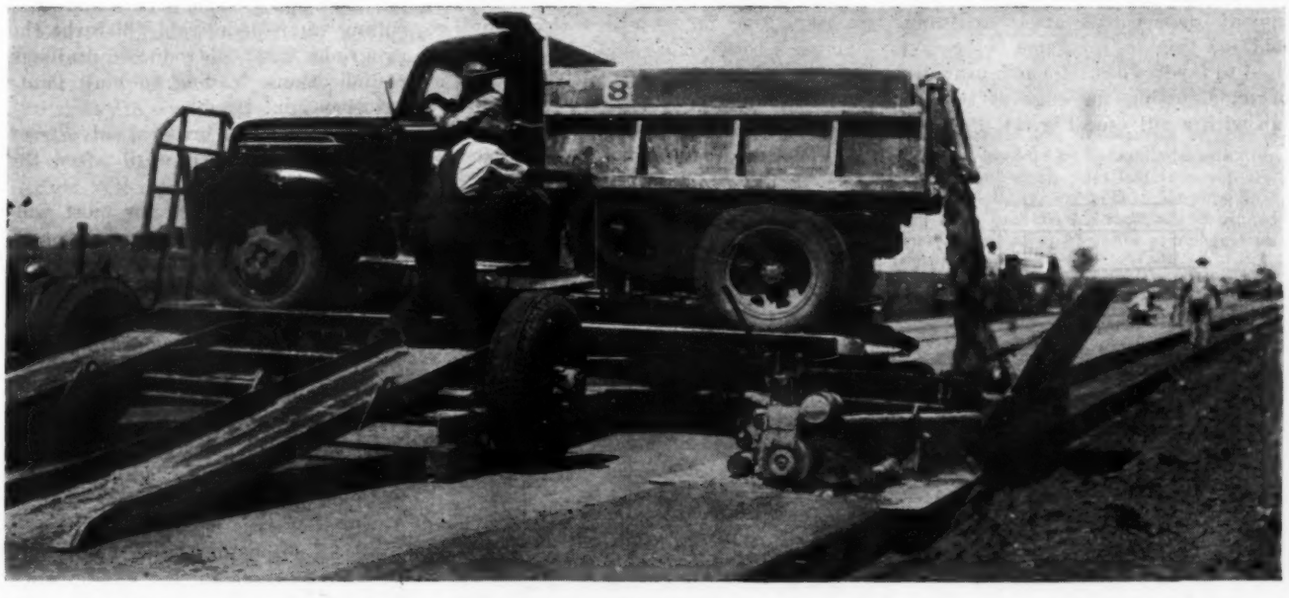
But to Texas highway contractors this program has meant something more. Besides giving them some very welcome jobs, the widening projects have come as a challenge to their ingenuity. These "narrow-gauge sidewalks," as one contractor calls the 3-ft. or 6-ft. strips usually involved, present many job management problems and cry out for special equipment not available in any manufacturer's catalog.

Another purpose of the program, according to state highway engineer D. C. Greer, is to help arrest deterioration of some of the state's older pavements under excessive traffic.

Widen One Side or Both

Initiated under WPB Order L-41-e, the widening program is in full swing this spring after December 12 and subsequent lettings. The program is confined to roads carrying over 1,000 vehicles per day. Projects vary generally from 10 to 20 miles in length. The state highway department in planning the program has kept in mind the economy of offering contractors fairly long projects, or nearby jobs grouped under one bid. Widening is done on both sides except where special local conditions made one-side widening more feasible. Award prices have ranged from $2.50 to $3.12 per sq. yd. Some higher bids have been rejected.

The details of designs were worked out by calling together the district engineers of districts which have considerable concrete needing widening. A design was sought which would be effective, economical and utilize the least manpower. Fig. 1 shows the 1945 wartime design adopted for a typical 3 ft. x 10-9 in. widening strip, which matches the old pavement edge thickness and tapers off to one inch less of



Concrete batches were dumped from a turntable mounted on a special flatbed truck frame. This self-propelling outfit also towed the spreader box as shown in this rear view

Trenching

Towles' method, involving three passes with a motor grader fitted with a special blade. First and second passes as pictured. Note notch in blade and use of casters (see arrows) which ride pavement top and edge to control position of blade

Fig. 2. Sequence of grade cuts for widening on the Towles contract

thickness at the outside. This cross-section has the advantage of being thickest on the inner edge where traffic loads are concentrated. Also the tapered or wedge section on a subgrade, sloping toward the old pavement, as used on the Towles Const. Co. job and some others, tends to hold the old and new pavements together and resist separation under traffic loads.

However, not all the district and headquarters personnel of the Texas highway department are thoroughly "sold" on this design, some being disposed to favor a design which provides for undercutting the edge of the old slab with a sill (see Fig. 1). Projects utilizing this design will probably be let during the season.

No keying or dowelling is attempted. In contrast with another recent extensive highway widening program (that of Indiana), reinforcement is used. For a 3-ft. strip it generally consists of two or three lines of ½-in. round bars with 20-in. splices. Redwood strips are placed at all expansion joints, matching joints in the original pavement.

In this connection it is significant to note that on certain projects high percentage of expansion joints in the existing concrete—6970 in one case—were found on exposure to be "in trouble" structurally due to infiltration of gravel or dirt from the subgrade. These invariably were poured joints. The typical failure not visible from the surface is a shearing failure shown in one of the accompanying photos.

Also in contrast with the practice of several other states, the subgrade under the widening *is not rolled*. Department engineers feel that the compaction obtained in building the road originally (and by subsequent traffic on shoulders) is sufficient, and that rolling often undesirably disturbs the subgrade and introduces drainage complications, leading to high joints or other joint trouble.

No widening of bridges, culverts or shoulders is planned until after the war.

Concrete is specified for most widening, although flexible base or soil-cement with bituminous surface is being employed on a few projects. While the concrete pavements being widened with concrete will in some cases be resurfaced in the near future, such resurfacing is not part of the 1945 work.

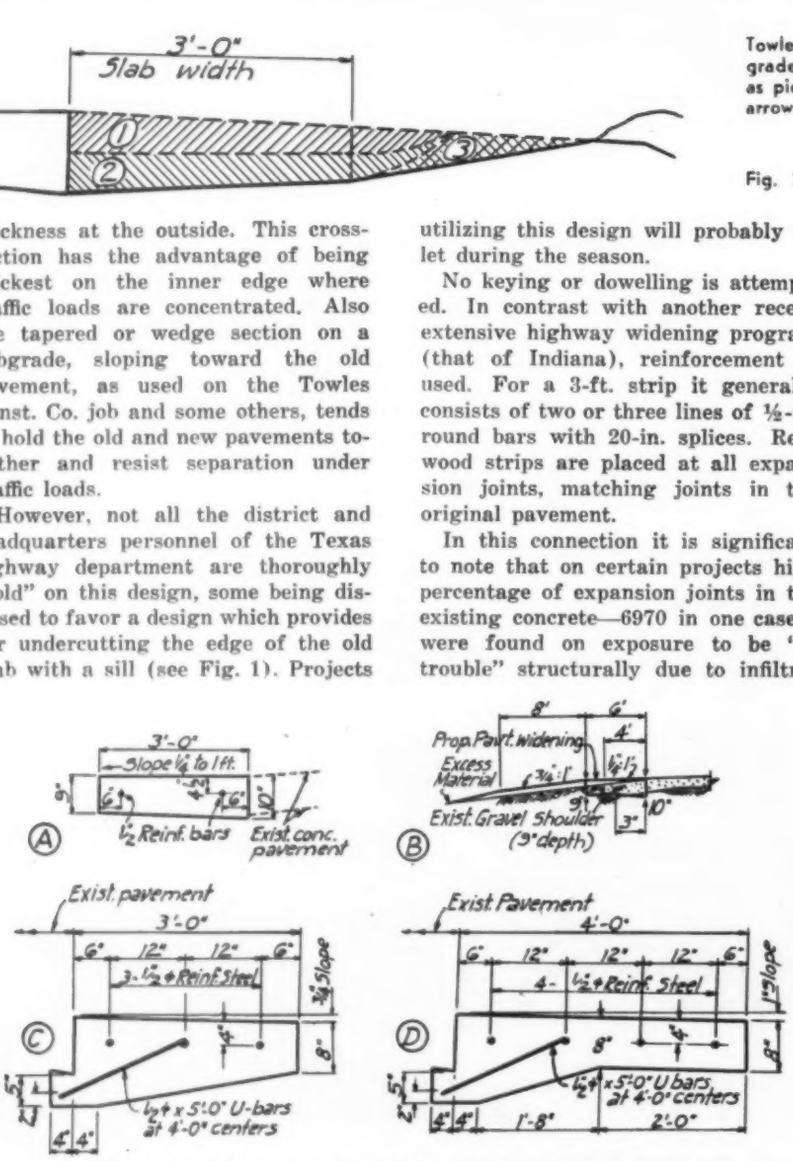


Fig. 1. Typical widening cross sections being used in the Texas 1945 program

Towles Employs Novel Equpment

Perhaps as interesting as any widening job from the standpoint of methods and equipment was that of Towles Construction Co. of Dallas, on U. S. 75 (Houston-Dallas main line) between Fairfield and Buffalo. Length, 17.5 miles, or 35 miles of 3-ft. x 10-9-in. widening. Bid price, $190,000,

the unit slab price being $3.08 for 61,116 sq.yd. The bid was on Texas "strength" specification under which the cement content is left to the contractor and 500-lb. beam strength at seven days is required for acceptance. Towles, like other contractors, has had to employ finishing methods appropriate to the lean, dry mixes encouraged by Texas specifications.

Towles used five special devices and they evidently paid off, to judge by the speed and ease of his job, which averaged a mile a day of widening strip on concreting days, reaching 6,000 ft. maximum in 10 hours with a 65-man total job payroll. This equipment consisted of a special trenching blade mounted on a motor grader for cutting the widening trench; a novel fine-grading and form-setting machine; a truck-mounted turntable adapted from a commercially made unit; a concrete spreader box shop-built for this work, and a special vibrator unit.

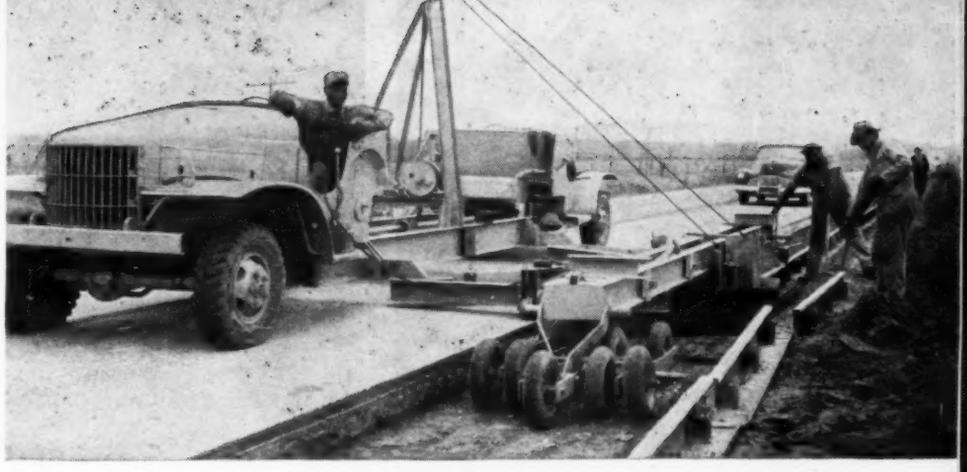
Excavating the Subgrade

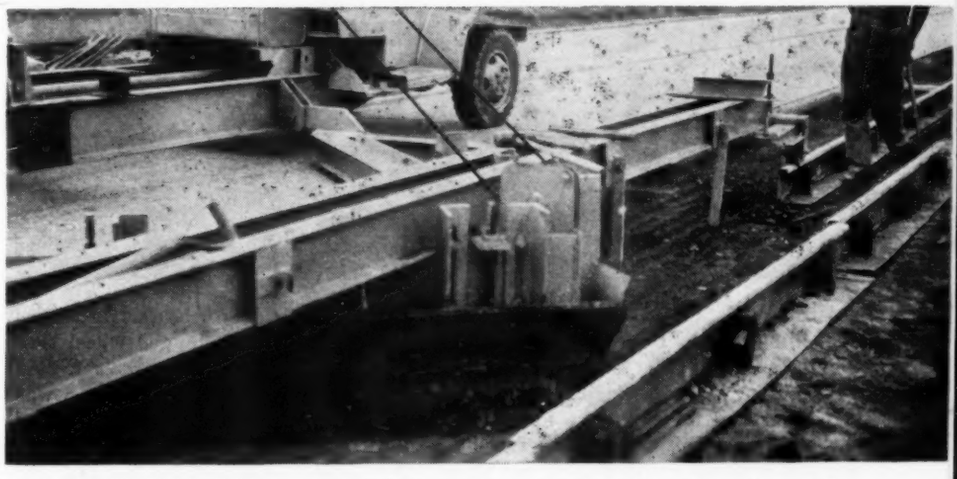
The grader used for trenching was equipped with a short blade having an edge curving upward on the right or shoulder side to conform with the contour of the widening trench. On the side adjacent to the old slab the blade was fitted with two caster units made from discarded ball bearing rings. One caster rode the pavement top, limiting the final depth of blade cut, while the other caster rode the exposed edge of the slab, serving to hold the blade a fraction of an inch out from the slab as the operator hugged the pavement with his machine.

Trenching into the lightly turfed sandy clay soil was completed in three steps over a work section of perhaps 1,000 ft. The first cut peeled sod and took out about 4 inches of depth. The operator then backed up and made another cut to within ½ to ¾-in. of final depth, with the blade set to give the desired 1-in. inclined plane of the subgrade. Then in a third trip the trench was widened on out well beyond the form line in a single cut, as shown in Fig. 2. The grader using the same blade later threw dirt against the finished slab and dressed the shoulder for seeding.

Fine Grading a la Goldberg

Next came fine grading and form setting, which were accomplished all in one quick operation, using a novel two-headed outfit designed and built by E. B. Sneed of Dallas, another Texas contractor. Both operations were performed with a framed apparatus which extends outward from the side of a long-wheel-base propelling unit traveling along one lane of the





Two-headed truck used to propel a combination fine-grader and form-setter of special design. (Upper view): Forward end, which can be lifted or lowered by hydraulic lever beside driver's seat. (Middle view): Rear end. Note flanged wheel which rides last form rail set. Not shown are two casters which ride exposed edge of slab. (Lower view): Showing fine-grading plow and two vertical guides against which form sections are thrown and pinned down as the machine moves up. Boom and winch lines are for pivoting entire attachment up to vertical position while in transit as shown below

Spreader Box

Towed by the turntable truck, this box, also of special design, saved many man-hours on the Towles contract. Note tubes through which lines of reinforcing slipped, and vibrator mounted on the screed end

* *

Turntable for Dumping Concrete

Front view of special turntable which speeded dumping of concrete into spreader box in widening trench

existing slab. First, to describe the propelling unit. It consisted of the front ends of two four-wheel-drive Dodge army trucks facing opposite directions and joined with a long, low chassis frame. This two-headed "truck" exerted 4-wheel traction in either direction, giving the power needed to make the final fine-grading cut. One driver operated it from either end.

Next, to describe the "business" part. It included two diagonal fine-grading mold board blades which acted to peel and throw dirt beyond the form line, and a pair of vertical arms or guides against which sections of steel forms were set for quick, accurate positioning. The front end of the apparatus was supported on rubber-tired wheels riding the subgrade. (Mr. Towles plans to substitute a single wheel for the small wheels pictured.) The elevation of the blades was adjusted by a hydraulic unit on the front end. A caster riding the pavement prevented cutting below grade line.

The rear end of the apparatus was carried on a small flanged wheel that rode the form section just set. As each additional 10-ft. form length was placed against the guides and pinned down, the driver "threw her in low," fine graded another 10 ft., and the cycle was repeated.

Speedy Concrete Placement

Working with a crew of two form setters, a driver, and a foreman, this outfit placed a 10-ft. form every 40 seconds, progressing 280 ft. in one 20-minute period of observation.

The frame, incidentally, was hinged to the truck chassis, so that it could be hoisted to a vertical balanced position for trundling down the road in high gear on long move-ups or between jobs.

Back of the fine grader, a thin layer of fine blow sand was spread by hand over the finished grade, to fill voids or blade-breaks left in the damp clay. This step saved the contractor considerable yardage of concrete. Actually the grade was prepared so accurately that the yield on this job was within .04 of 1% of theoretical requirements.

Concrete was wet batched in 65-cu. ft. bodies from a stationary 27-E paver, the paver moving forward each night. Batch trucks were driven on a truck mounted turntable, the table then turned at right angle with the roadway, and concrete dumped into a spreader box alongside, each load carrying the job forward 27 lin. ft.

The turntable was assembled from parts of a commercially made unit and from salvage truck parts. Its usefulness was doubly apparent during a breakdown period when each truck lost considerable time backing around on the pavement.

The spreader box, also a Sneed design, embodies several interesting features. It was towed by the turntable truck. The box was strongly built of steel; for details see accompanying photos. The three guide slots picked up lines of reinforcing rods and rods were allowed to slip along through three tubes leaving the bars in correct position as the concrete widening prism was formed.

The contractor mounted an internal vibrator unit into the strike-off floor on the back end of the spreader, and tried this arrangement for the first several miles. A heavy two-man wooden bullfloat was used in conjunction. But because of unsatisfactory labor on the bullfloat, he replaced both the float and the built-in vibrator with a specially designed hand-pushed steel screed on which a vibrator was mounted.

Finishing operations included sparing use of a long-handled wood float, a second-hand float, belt drag, edging, and very light passes with a small

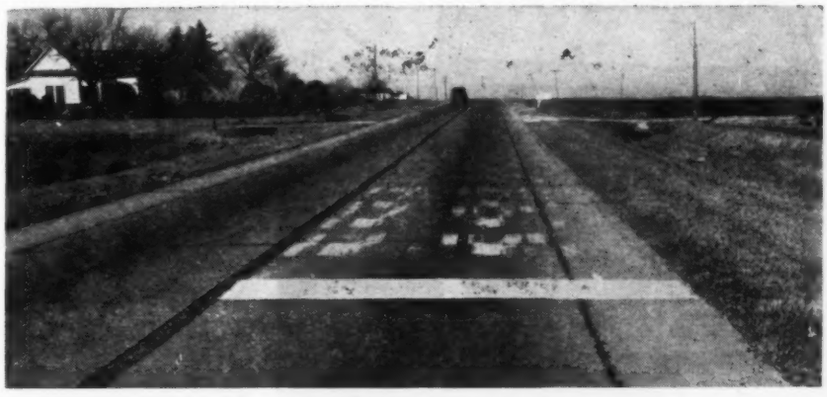
Finishing

Towles filnished concrete with a long and short handled wood float, edger and belt drag, followed by wet canvas curing cover

bristle broom to smooth marks left by the edger. About 27,000 lin. ft. of cotton curing mats were required to keep up with the job.

Towles' concrete mix included 15% admixture of a locally available fine sand which graded 50% passing 100 mesh and 11% passing 200 mesh, this sand being added as a third aggregate after beam tests showed that it enabled the contractor to meet strength with about 2.6 sacks of cement per cu. yd. A 3-compartment batch-bin was employed along with a bulk cement elevator at a rail siding two miles from one end of the job. Due to insufficient trucks, dry and wet batch delivery proved to be the chief cause of such delays as occurred on this project.

The foregoing Towles contract was under the Bryan district of the Texas highway department, George M. Garrett, district engineer. Cecil Barmore, resident engineer, died during the course of the project.



Do motorists use the entire width? These tire marks through wet paint, from a series of tests, indicate that the average motorist tends at first to stay within the widening strip

Typical crack in widening strip (foreground), occurring at or near crack in old slab

Evidence of structural deterioration due to gravel or dirt being forced up into poured joints (lower part of slab on left sheared off). Over two-thirds of all points on one project were found to be defective

Farnsworth Used Simpler Equipment

Another concrete widening job noted was that of R. F. Farnsworth & Co., of Houston, on 20 miles of U. S. 290 near that city. Nineteen miles of widening consisted of a 6-ft. slab on one side, this strip occupying extra

Truckers, on the other hand, wasted little time in utilizing the widened slab

Concrete was delivered in agitator-type bodies which dumped by tipping sideways

★

Farnsworth's Concrete Widening Job in Texas

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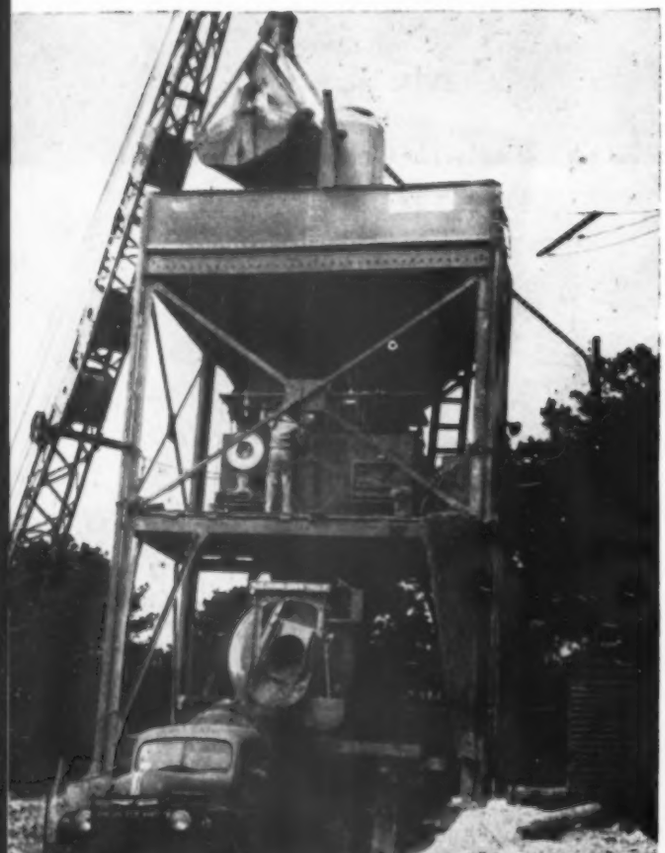
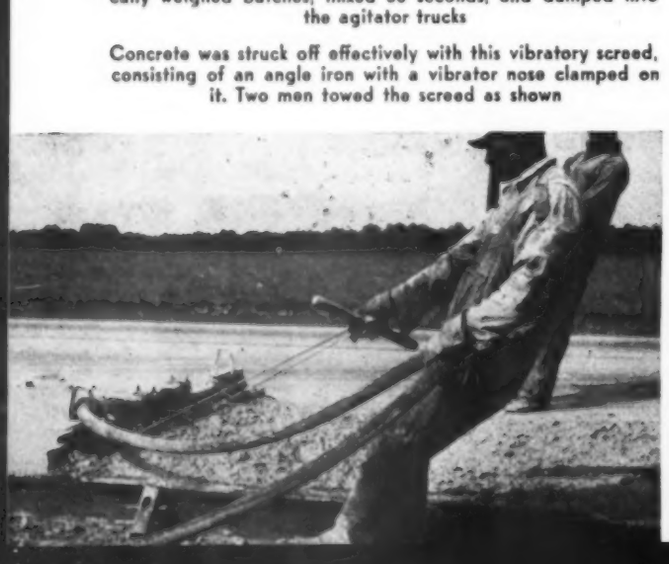


Batch plant included a 28 S mixer which received automatically weighed batches, mixed 30 seconds, and dumped into the agitator trucks

A power subgrader was shortened to 6 ft. for this job

Concrete was struck off effectively with this vibratory screed, consisting of an angle iron with a vibrator nose clamped on it. Two men towed the screed as shown



Redwood joint being set in widening strip to form continuation of joint in old slab. Poured rubber compound seal used

wide shoulder space left years ago in building the existing pavement alongside an old wagon road. Three-foot strips were used on the remaining mile across a bridge-dotted fill.

The bid price was $2.86 for a 10-9 in. cross section which included two lines of ½-in. round bars (spaced 6 in. from slab edges). Farnsworth operated from a central plant in which concrete batches dropped into a 288 mixer, received 30 seconds of mixing, the concrete then being dumped into 30-cu-ft. agitator trucks for hauling to the job.

Concrete was placed on the subgrade from a transverse truck position. The hardpacked, gravelly shoulder was trenched out with an ordinary motor grader blade, followed by a standard power form grader and by a mechanical subgrader which had been shortened to fit the 6-ft. width.

Concrete was struck off by a vibratory screed towed by two men. The nose of a portable gasoline-powered hand vibrator, clamped to the bridge, furnished the vibration. Then followed a long-handled float, belt, and membrane curing. The outer edge was rounded but use of an edger was omitted by the district engineer of this district.

About 2800 ft. of 6-ft. strip was placed on good, steady 10-hr. days in spite of a shortage of workers. The minimum crew included 1 form grader and motor grader operator, 1 subgrader operator, 6 other men on subgrade and forms, 7 or 8 truck drivers, 7 men on spreading and finishing, 1 man on curing and general work, 3 men pulling forms, patching and cleanup, 1 mechanic, 2 men on batch plant and clamshell, 2 in cars working cement into the bulk cement blower, and 3 foremen (subgrade, concrete, plant).

T. C. Caldwell was resident engineer, W. J. Van London, district engineer.

Concrete widening methods very similar to the foregoing were employed on another 20-mile widening contract in the Houston district, also held by R. P. Farnsworth & Co. Here a special procedure was adopted to forestall rapid deterioration that had begun to occur in the old slab under excessive traffic. This job involved a section of U. S. 59 through a low, heavy rainfall area of poorly drained black gumbo soil (70 in. rain annually). A hasty check this spring showed 359 pumping joints in the 20 miles. Without waiting to make subgrade correction the expedient was decided on of putting a 1-in. layer of asphalt over the existing pavement for whatever protection it would provide, then building concrete widening strips, after which bad joints in old pavement were to be undersealed with hot asphaltic cement and the entire pavement given a hot-mix surface.

Austin Road Co. Also Uses Special Equipment

The Austin Road Co., of Dallas, which has several concrete widening contracts plans to haul centrally mixed concrete to the job, back trucks onto a turntable mounted out on the widening forms, and dump the trucks while in a position parallel to the roadway. A duplicate of the Sneed-designed finegrader-formsetter used on the afore-described Towles contract will be employed.

Other concrete widening projects are being prepared for May and June lettings as this is written and it will be interesting to watch these jobs for additional variations in field methods.

▼

Disposal of Surplus Machinery Shifted to Department of Commerce

Since your last issue of R & S came out the Office of Surplus Property, which has had charge of surplus construction equipment disposal, has been shifted from the Treasury to the Department of Commerce.

An SPB spokesman indicated that the previous organization in the Treasury Procurement Division would be transferred as a functional unit to the new department. At the same time, however, there are reports of many new faces coming into the picture.

No announcement was made regarding the field organization of the new setup. However, contrasted with the 12 regional offices of Treasury Procurement, the Department of Commerce has, in addition to 12 regional offices, 14 district offices. It may be assumed that these offices will be involved in the disposal program.

Direct Sales Contemplated Under Pending Bills

Meanwhile, present procedures for the disposal of surplus vehicles and construction and farm machinery, are slated for revamping if two bills (S. 858 and S. 859) recently introduced in Congress become laws. At the present time construction machinery is sold only to legitimate equipment distributors. Under the terms of the proposed measures vehicles and machinery would be sold direct to farmers and veterans "for their use in earning a livelihood". A 10-day preferential period would be allowed in which time farmers and veterans could purchase such equipment in lots of one or more at prices no higher than those charged to others.

Construction Machinery Mfrs.' Industry Advisory Committee

The appointment of a Construction Machinery Manufacturers' Industry Advisory Committee was announced today by the Office of Price Administration.

The new committee will hold its organization meeting in Washington, D. C. on May 1, 1945. Approximately 350 manufacturers of construction machinery whose ceiling prices are established by Revised Maximum Price Regulation 136—Machines, Parts and Industrial Equipment—will be represented. Members are:

W. E. Miles, Oliver-Cletrac Co., Cleveland; J. R. Steelman, Koehring Co., Milwaukee; R. K. Stiles, Austin-Western Co., Aurora, Ill.; W. J. Hazeltine, Buffalo Springfield Roller Co., Springfield, O.; W. Blackie, Caterpillar Tractor Co., Peoria; D. D. Kennedy, Foote Co., Inc., Nunda, N. Y.

D. M. Burgess, R. G. LeTourneau, Inc., Peoria; Larry Glaser, Littleford Bros., Inc., Cincinnati; H. Gusman, Wooldridge Manufacturing Co., Sunnyvale, Calif.; Paul B. Cochran, Buckeye Traction Ditcher Co., Findlay, Ohio; Kenneth Lindsay, Iowa Manufacturing Co., Cedar Rapids, Iowa; R. W. Newberry, Bucyrus-Erie Co., South Milwaukee, Wis.

R. T. Harris, Blaw-Knox Co., Pittsburgh; W. B. Greene, Barber-Greene Co., Aurora, Ill.; George J. Dimond, Insley Manufacturing Corp., Indianapolis, Ind.; F. H. Moline, Pacific Car and Foundry Co., Seattle; E. F. Armington, Euclid Road Machinery Co., Cleveland; H. R. Meeker, J. D. Adams Co., Indianapolis.

▼

State to Pay Cost of Roads in Cities

On April 10, Governor Dewey signed the Seelye Bill, under which the State will assume the entire cost of arterial highways within cities and half the cost of acquiring necessary rights-of-way within cities for such highways. The new law is expected to result in an eventual saving of $110,000,000 to the cities, of which New York City will save about $60,000,000.

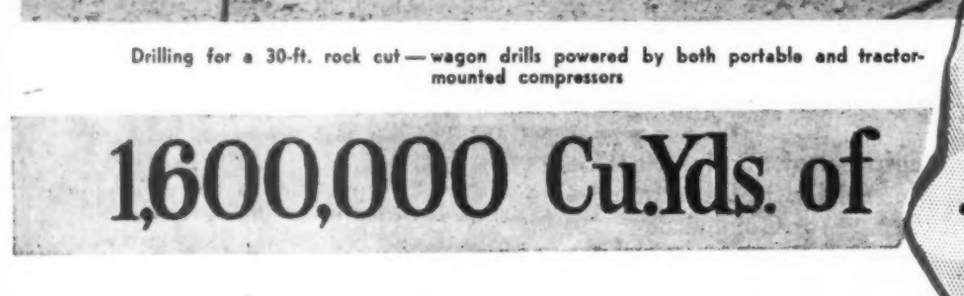
Federal aid on urban highways in New York State, including city routes, is $55,000,000 over a three-year postwar period.

The bill contains provisions whereby the cities may ask for incidental benefit construction or added improvements, solely at the expense of the city. In order to comply with the New York City Charter and Administrative Code, the bill was divided into two parts, one of which is applicable to New York City only.

Drilling for a 30-ft. rock cut — wagon drills powered by both portable and tractor-mounted compressors

1,600,000 Cu.Yds. of ROCK

***Myers-Western's** 115-machine outfit averaged 12,000 cu. yd. daily, 65% rock, with 27,000 cu. yd. peak days through wet, cold autumn and winter. Electric 5-yd. shovel and 800,000 lb. of dynamite helped whip sandstone while 12 and 33-yd. scrapers moved earth. Side-hill fills chief engineering problem at this CAA airfield which involves 170-ft. max. fill depth and 2,400,000 cu. yd. excavation.*



PROJECT—Wood County Airport, Parkersburg, W. Va. Civil Aeronautics Administration, 1st Region, designing and contracting agency; W. O. Diebler, project engineer.

Job consists of three runways, 4000, 4000 and 4500 ft. x 150 ft., complete taxiway system, 150 x 200 ft. apron, all pavement concrete. Involves completion of project begun in 1940 by WPA, which had partially graded and placed stone base for one runway.

Contractors—Grading and Drainage: Myers-Western, of Parkersburg being a Joint Venture of Ralph Myers, Salem, Ind., and Western Contracting Corp., Sioux City, Ia.; Foster Myers, supt.; principal item, 54c for unclassified; total bid $1,700,000. **Paving:** Williams Construction Co., Little River, Md.; $580,000.

Timetable—Awarded Aug., 1944. Grading begun Sept. 11, completed May, 1945. Paving, summer, 1945 (100-day contract).

Features of Project—Phenomenally deep fill (170-ft. max. and 60-100 ft.

A real time and money saver was this pair of wagon-drill units, mounted on the front of a heavy tractor which also carries a compressor on a rear platform

Showing one of the fleet of 27 heavy rock trucks

over wide area); heavy grading (2,400,000 cu. yd.); extensive rock removal (65% of total), 40-ft. max. cut, 20-30-ft. prevailing depth of largest cut totaling 800,000 cu. yd.

Site Conditions—Field located on a ravined, semi-wooded hilltop area underlain by clay overburden, sandstone, hard shale and soapstone. Most of sandstone and much of shale required blasting. On exposure both shale and soapstone crumbled rapidly into slippery-when-wet clay which compacted well when dry but slowed up equipment in wet weather, especially in early stages of job when haul roads were steep.

Clearing and Grubbing. Done for a lump sum contract price of $10,000 and an additional per acre price totaling another $10,000 and involving actual clearing work on 150 acres of hilly ground with some cleaning up over 600 acres. Myers-Western took over on a clearing contract which the county had under way to continue WPA clearing work. Several hilltops had to be hand chopped. Dozers and draglines with winch lines grubbed and piled stumps for burning with diesel oil.

Removing Old Slides—Over 50% of all filling involved widening out natural hillsides or old WPA fills. Extensive slides had occurred in the earlier fills, due to insufficient keying and probably aided by progressive 40,000 cu. yd. of mud. Existing sidehill fills totaling 100,000 cu. yd. had to be entirely removed in slide areas. This was done through wet autumn months with 13-yd. tractor-drawn scrapers, the only machines that could go into steep gullies and bring the old material out.

How Slopes Were Widened

New Sidehill Filling—New fills were built on a 2½ or 3 to 1 slope. The procedure for rebuilding fills up hillsides (Fig. 1) is summarized as follows:

(1) Hillside completely stripped of all unsuitable material, which operation roughened up the natural slopes somewhat.

(2) Benches 12 to 15 ft. wide (scraper width) were cut at vertical intervals of about 25 ft., the spacing depending on slope and condition of ground.

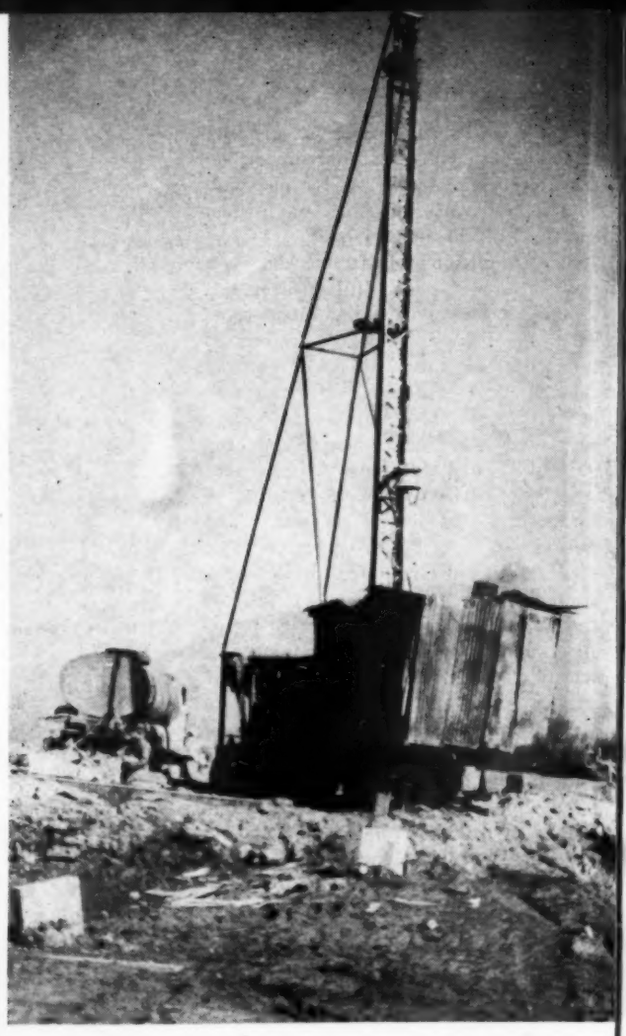
(3) Still using scrapers, a keyway trench was dug along the toe of the new slope. The trench varied in depth but usually was taken down to rock or hardpan.

(4) Filling began with placement of largest obtainable sandstone rock in the trench. Rock was placed in 3 to 4 ft. lifts until fairly level benches were formed across the undulating ground and ravines of the hillside.

Myers-Western found it worth while to import and set up a 5-yd. electric shovel for this job. Note power line in background being carried over haul road

Getting ready to bust up a big one which the 5-yd. shovel nosed out of the way

5-yd. manganese toothed dipper prying a 20-ton rock that the drillers missed



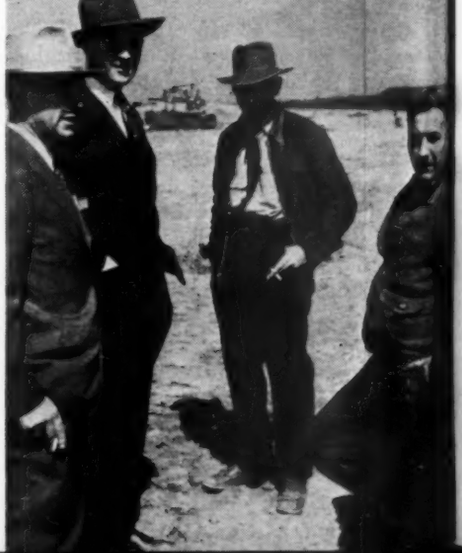
(Above): One churn drill was used for making deeper blast holes

(Upper Left): Slitting dynamite so that it will mash down tighter into the over-size churn drill holes. 800,000 lbs. of 40% gelatin used on this job

(Left): Another view of tractor-mounted drills. This outfit can skin up rough hillsides and across gullies and start to work most anywhere. The arms projecting diagonally from the tractor are raised or lowered by a chain to adjust the height and position of the drill units

(Lower left): One of the two 2½ yd. diesel shovels which took heavier cuts down the two lifts

Clyde Goen and P. J. Boyle of Myers-Western; Harry Lewis, with the contractor; W. O. Diebler, project engineer for CAA



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This served the double purpose of expediting scraper hauling and dump truck delivery, and of supplying a base which simplified the job of accurately staking the slopes on up. Big stones were dumped over the edges of 4-ft. lifts so that they would mix with fine material and fill voids as they fell into place.

(5) Slopes were carried on upward in smaller lifts using earth or well broken rocky or shaley material, the coarser material being put in the face. A 10-ton smooth roller went in soon as it could get down to the work, compaction meanwhile being begun with sheepsfoot rollers, which had some trouble keeping out of the path of the dumps on narrower shelf situation.

To help drain the benches and key trench during construction and afterward, dozer slits were opened out from the trench at selected intervals and backfilled with large rock to form crude french drains.

Rock Removal—Nearly all the 1,600,000 cu. yd. of rock, shale and soapstone required blasting. While one ledge was moved with little shooting, the largest cut area required thorough drilling, hole spacing being varied constantly with material encountered.

Drilling was done with one churn drill, used for the deeper holes, and 8 compressed air wagon drills. Two portable diesel-powered compressor units furnished air, along with three tractor-mounted compressors.

Two Drills Mounted on Tractor

Of special interest was a heavy diesel tractor with mounted compressor, on whose front end two wagon drills were mounted by means of a heavy cross bar and diagonal bracing (see photo). In use by the Western outfit for several years, this unit has proved a great labor and time saver in rough ground. The tractor just snakes up the hillside to where drilling is to begin, wheels into a fairly level position, and drilling can then begin without the necessity of dragging two separate wagon drills, hose, etc, and wheeling them laboriously into position with 6 or 8 men.

About 800,000 lb. of 40% gelatin dynamite was used on the job. In order to adapt available dynamite to the churn drill hole, cartridges were slit in 5 or 6 places with a knife before inserting, so that they would spread and pack away tightly when tamped.

5-yd. Electric Shovel

Two 2½-yd. diesel shovels and one 5-yd. electric shovel loaded rock, taking out 800,000 cu. yd. in one area alone. After stripping with 13 and 33-yd. scrapers the 2½-yd. shovels handled the prevailing cut depth generally in two lifts, while the 5-yd. electric worked a face as high as 30 ft. in one lift.

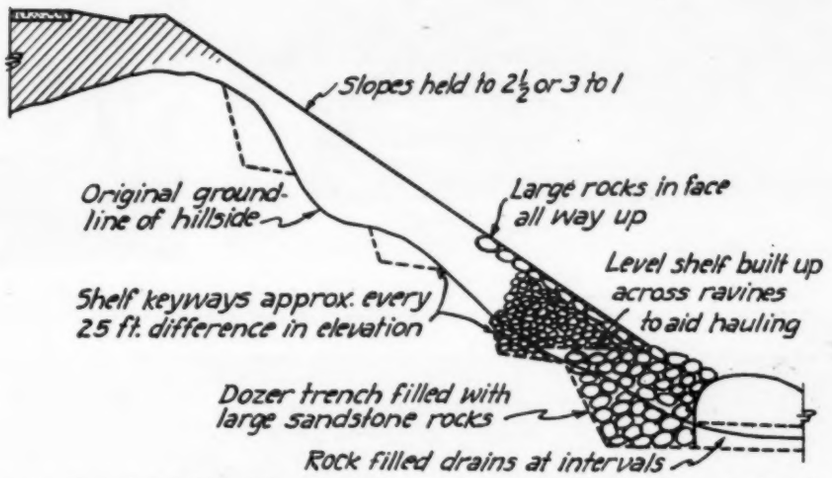
Slopes held to 2½ or 3 to 1
Original ground-line of hillside
Large rocks in face all way up
Level shelf built up across ravines to aid hauling
Shelf keyways approx. every 25 ft. difference in elevation
Dozer trench filled with large sandstone rocks
Rock filled drains at intervals

Fig. 1. Typical of hillside filling which was a major problem at Wood County Airport

The big electric machine demonstrated both the advantages and disadvantages of such a unit on a large construction job. On the loss side of the ledger was the fact that another shovel was tied up for a time in loading and unloading the 5-yard's shipping assemblies at the siding, and that of a second shovel in assembling it and taking it down. Also, there was the expense of stringing a 6-mile power line to the job and across the field.

But undoubtedly outweighing these factors was this shovel's performance, once it got going. In a good deal of the work it took out rock with considerably less shooting than required for a lighter shovel and dug with lower unit costs. And its ability to send out 400 to 550 8-yd. loads per 10-hr. day was a big factor in keeping up continuous high speed production, so necessary to the over-all efficiency of a big, complicated excavating and fill-making job such as a modern airport. This one shovel alone moved about 700,000 cu. yd.

Rock Hauling—Most of the rock was hauled by a fleet of end dump, diesel-powered rock trucks, up to 27 in number, which were assisted for a while by several tractor-drawn, crawler-mounted wagons.

General Notes on Earth Moving—Myers had his well-known fleet of 33-yd. scrapers here. They moved brown shale after some blasting, worked hard pan with plenty of rooter help and downhill pusher loading, and handled occasional boulders up to 2 cu. ft. (300-lb. size) although not without plenty of wear and tear. These big fellows were used on a 4000-ft. haul toward the last, beyond best economic range for tractor-drawn machines, but done in this instance to make best use of equipment at hand.

The big scrapers were used at night in good dirt but only day shifts in hard or boulder-strewn ground due to mechanical hazards. The five 13-yd. scrapers were always busy, first in building up sidehill fills and later in constantly varying short-haul assignments, topping out grade with pockets of good material, etc.

Haul Road Maintenance—A special point of concern on any job, this was carried to the limit here. Two and sometimes three motor graders patrolled the main haul road constantly. Several bulldozers did nothing but keep the scraper loading area ship

Showing part of the slope of a fill that is 170 ft. high across the gulley (not visible) at the left. Believed to be the highest airport fill in North America

(Left): Nope! Not an accident but a rig flopped over for some welding. (Right): 14,000 gal. diesel fuel capacity was supplied by 8 tanks, located on a hillside to permit gravity filling from tank wagons and gravity filling of service trucks through pipes in foreground

33-yd. scrapers handled the bulk of earth excavation. Loading down near hard pan required plenty of pusher help on downhill loading

Rough going rather than long haul was the problem. The haul roads were maintained by a fleet of graders, aided after rains by scoops and dozers

shape, help spread at the scraper dumps along with a grader, and keep the floor cleaned up around the shovels.

After each rain, scrapers, dozers and blade operators all pitched in and peeled a layer of mud from the road and from scraper workings and opened up surface drainage where necessary. As high as 3,000 passages of heavy construction vehicles daily were handled on main haul roads, and the cost of keeping the road smooth was repaid many times over in production speed and economy.

Grading Equipment—Major units in the combined contract outfit comprised about 115 pieces, including the following maximum outfit, which by the way was nearly 100% diesel:

ing maximum units:

2—2½-yd. shovels, diesel
1—5-yd. shovel, electric
8—33-yd. scrapers
5—13-yd. scrapers
6—motor graders
2—heavy-duty rooters
8—double-drum sheepsfoot rollers
30—heavy diesel tractors (7 equipped as dozers, 3 carried compressors) 27 10-yd. rear dump rock trucks. Several bottom-dump track-type tractor-drawn wagons (for a while)
3—10-ton smooth rollers
5—air compressors
8—wagon drills
1—churn drill
15—light plants
15—small, mobile light plants
1—¾-yd. crane-dragline (for clearing)
2—2000-gal. sprinkler wagons, trailer-type (specially built).

This equipment was maintained in two modern shops, the policy of Myers and Western being to keep separate repair and servicing set-ups.

Monthly Yardage Production of Myers-Western on Wood County Airport

Sept. (began 11th)	40,000
Oct.	360,000
Nov.	600,000
Dec.	450,000
Jan	270,000
Feb.	200,000
March	200,000
April	180,000
Total	2,300,000 cu. yd.

The lesser quantities during the last three months reflect change from two-shift to one-shift operation, existence of cold weather or wet conditions, and arrival at clean-up stage of job.

Paving and Drainage—About 45,000 lin. ft. of 6 to 36-in. pipe drains (concrete and v.t.) will be installed in the completed field. Three pull-shovels and one power trencher handled the work, which also required some rock removal.

Runway pavement will consist of 8-in. and 9-in. uniform concrete, unreinforced, supported on 5-in. rolled thickness of select granular base. Taxiways, runway ends and special areas to be 9 in. thick.

▼

County planning in general and airport development in particular in New York state will be aided by newly enacted bills. One enables counties with the manager or executive plan to develop a master county program linking city and town interests. The law also provides the state to step into a locality, upon petition of a city, or owner of an airport, in the event the city and the town in which the port is located cannot agree on zoning regulations. In that case, the state may promulgate the zoning rules. Barring construction of any structures that would be flying hazards is the aim.

The other law gives cities and towns power to establish zoning regulations around city airports located in towns (townships). It also legally established flight hazard areas or turning areas within half a mile of an airport.

Editorial

Fix the Subgrade First!

A GREAT deal of older concrete has been given some kind of a resurface during the war years. Uusually this has consisted of bituminous leveling and topping, although some second story concrete is noted.

In some instances this editor has wondered whether this cover-up job has always been necessary, or at least whether enough mile-to-mile study has been given to the problem to support the judgment of the highway department, and whether underlying causes of deterioration have been corrected.

"It was getting rough, so we covered it up," is a good reason only if you have an idea of about what percentage of the expense can be charged to increased motoring luxury and riding comfort and what part to hard-headed investment in economical highway service. Nearly always both motives exist and sometimes it may be best to "get along" for a while and put available funds to other use.

No doubt, on the other hand, many of our overloaded arterial highways have been saved from serious deterioration, or at least their pavement life has been prolonged, by intelligently planned resurfacing which ironed out impact spots, contributed a measurable cushion, gave protection from surface water, or added definitely to the slab strength.

But very often the critter causing the most trouble —the subgrade—has not been given proper attention. A rocking or pumping joint will still pump after the pavement is covered. Resurfacing seldom seals a crack for long. Engineers in one state recently underlined one important rule: don't resurface until you have corrected pumping joints and their cause.

To which we might add another: give more detailed study to the whole economics of pavement salvage.

▲

Widening Techniques

WIDENING of 16 and 18-foot pavements to 22 or 24 feet is a task that fortunately has not had to wait until the end of the war. Certain states, notably Ohio and Indiana in 1944 and Texas this year, have been able to widen several hundred miles under WPB limiting orders. Other states need to do systematic widening as soon as restrictions are lifted.

Widening seems so simple. You just add a strip of material. But a good many serious engineering questions bob up in a hurry, accompanied by the usual differences of opinion. For example, should the widening trench be rolled, as some states specify, or left strictly unmolested, as the Texas engineers prefer? And how about joints? Experience shows that wherever the original concrete pavement is cracked, the concrete widening strip will also crack due to edge friction with the mother slab. So why not put a construction joint adjacent to each crack, an inquirer asks, while observing that the irregular break offers better bond and that most widened pavements will be covered after a short time. Another question: When is undercutting of the old slab necessary or justified?

The service behavior of widening strips now being placed in Texas, as reported in this issue, should be studied and compared with performance in other states.

Even more interesting to our contracting brethren are the practical construction problems of building 3-foot widening strips with equipment designed for 10 or 20-foot pavements. Hats off to the Texas contractors for some real ingenuity here.

▼

Secondary Road Standards

WE DON'T envy the committee that is wrestling right now with design standards and policies to govern Federal-aid secondary road work after the war. Whatever it decides will leave somebody unhappy.

That there must be minimum standards everyone agrees. Without such standards we never could have achieved the remarkably unified and uniform primary system we have today. Wisely chosen standards similarly will help bring a quarter-million miles of secondary roads up to the status of a modern system in the decade after the war—a priceless goal to the nation.

Yet each community, each state, each region, has its peculiar local road needs. Each has a different problem of materials and terrain, of traffic character and density, of funds available vs. mileage needed.

We like the proposed specifications offered by the Michigan County Road Association. These cover three types or levels of construction—high, intermediate and low. Surface widths would be 24, 20 and 16 ft. Each type would also have different minimum requirements as to shoulder width, gradient, curvature, sight distance and other details. All three will be needed in the secondary program and will lend flexibility in its administration.

Three broad policies should govern secondary road development: (1) Know the local need; keep the initiative with local people. (2) Base type selection and expenditure on a study of probable traffic and land-use data. (3) Look ahead—but not too far. Use plain common sense such as the typical American farmer would use. It will keep engineering and administrative costs down.

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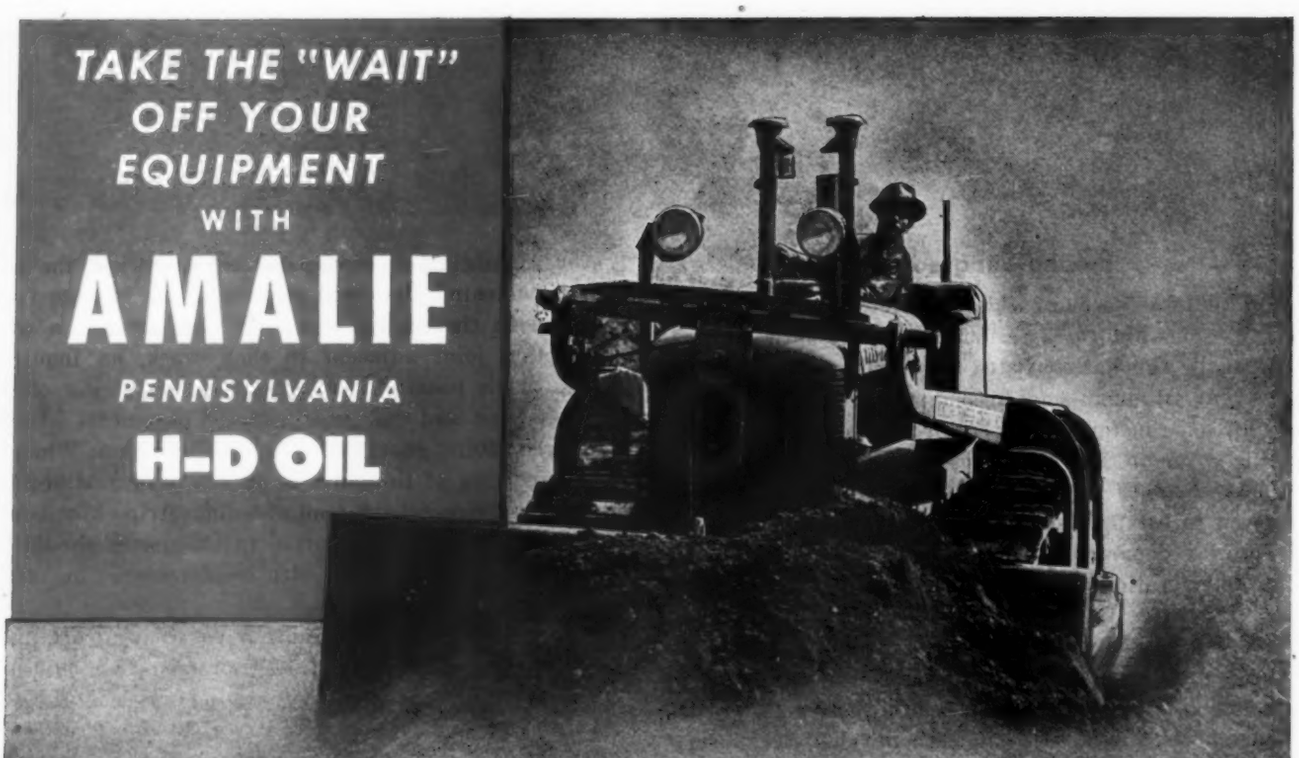

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Regulations for Administration of 1944 F. A. Highway Act

The highway program of every county and city as well as state will be affected directly by this "working" document, issued April 21 by Federal Works Administration, Maj. Gen. Philip B. Fleming, under recommendation of Thos. H. MacDonald, Commissioner of Public Roads, Washington, D. C.

REGULATIONS for carrying into effect the provisions of the Federal-Aid Highway Act of 1944 and the Federal-Aid Road Act of July 11, 1916, as amended and supplemented:

Sec. 1. Definitions. For the purposes of these regulations the following terms shall be construed, respectively, to mean:

(a) Act. The Federal-Aid Road Act of July 11, 1916, and all acts amendatory thereof or supplementary thereto (U. S. C., title 23), and the "Federal-Aid Highway Act of 1944" (Public Law 521—78th Congress), except those provisions which relate to national forest roads and highways, national park and national park approach roads and parkways, and Indian reservation roads under the Act of May 26, 1928 (45 Stat. 750).

(b) Administrator. The Federal Works Administrator, Federal Works Agency.

(c) Commissioner. The Commissioner of Public Roads, Public Roads Administration, Federal Works Agency.

Spotlight on States

(d) State highway department. The department of each state government adequately organized and equipped to exercise all the functions incident to operations under the Federal highway legislation and authorized, by the laws of the State, to make final decisions for the State in all matters relating to, and to enter into on behalf of the State, all contracts and agreements providing for State-Federal cooperative road projects.

(e) Latest available Federal census. The Federal census of 1940.

(f) Urban areas. An area including and adjacent to a municipality or other urban place, of five thousand or more, listed in Tables 13 and 14, Volume I, Sixteenth Census of the United States, 1940, published by the U. S. Department of Commerce, Bureau of the Census, 1942.

(g) Rural areas. All areas of the State not included in "urban areas."

1.2 Intent of the Act (Federal-Aid Highway Act of 1944). The Federal-Aid Highway Act of 1944 is held:

(1) To establish the pattern for a long-range program of highway development designed for the national defense and to serve the major classes of highway traffic broadly defined as (a) interstate or interregional, (b) intercity or intrastate, (c) rural secondary or farm-to-market, and (d) intra-urban, restricted in cities above five thousand to general use streets which are extensions of Federal-aid routes;

(2) To recognize the State highway department as the legal representative of the State including all government subdivisions in the administration of the Act within each State;

(3) To provide for a more comprehensive rural-road program through cooperation between the State highway department, the county or other appropriate local road officials and the Public Roads Administration in the selection and improvement of the system of principal secondary or feeder roads;

(4) To insure continuity in the direction of expenditures to accomplish the objectives of the long-range program by the selection of road systems as defined in section 1.4 and by an annual improvement program of projects lying upon each system (see section 1.6);

(5) To create for the purposes of the Act "urban areas" predicated upon the characteristic urban quality of traffic which overflows municipal boundaries into suburban communities and to make provision for aiding the planning and development of arterial highways to serve such areas.

1.3 Organization and powers of State highway department. Each State shall maintain at its own expense a State highway department as defined in section 1.1, having adequate powers and suitably equipped and organized to discharge to the satisfaction of the Administrator the duties required by the Act and by these regulations. From time to time as the Administrator may determine, there shall be furnished to him, by or on behalf of a State, information concerning: (1) laws affecting roads and the authority of the State and local officials in reference to the acquisition of rights-of-way, construction, maintenance, and control of roads; (2) the State highway department, how equipped and organized; (3) constitutional and legislative provisions relative to revenues for the administration, construction, reconstruction, and maintenance of roads; and (4) funds that will be available to meet the State's share of the cost of construction work to be performed and the sources of such funds.

1.4 Selection and Designation of highway systems. The highway systems designated to become the pattern for the long-range development of adequate highway service shall be so selected as to form an integrated net within each State and with like systems at State boundaries. There is no predetermined time limit for the submission of the full selection of the systems and no fixed maximum for the mileage of the systems other than the specific limitations of the Act.

Projects on the presently approved Federal-aid highway system, and on secondary road systems which were selected in cooperation with appropriate local road officials as required by section 3(b) of the Federal-Aid Highway Act of 1944, may be included in programs proposed by the State highway department for improvement under the Act without further system approvals. Prior to the inclusion in the program of projects lying off the approved systems, the routes of which such projects form an integral part shall be submitted by the State highway department and approved by the Commissioner as routes of the appropriate system.

The extent of the over-all mileage of the systems as finally approved shall be determined by the ratio of the estimated annual income that will be available from all sources for, and the estimated annual costs of, the maintenance, construction, and reconstruction of the mileage included in the long-range program and shall be so balanced as to permit completion of the initial improvements within a reasonable period of years. The con-

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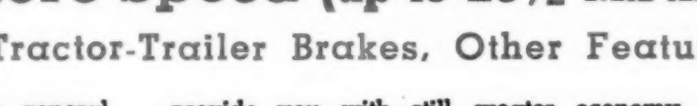

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servation and development of natural resources and of economic and social values, particularly those encouraging desirable land utilization, by providing adequately improved and maintained highways are to be given greater weight in the selection of routes for inclusion in the several systems than is the existing numerical traffic volume.

The highway systems to be selected and designated in accord with the requirements of the Act are:

(a) A national system of interstate highways as required by section 7 of the Federal-Aid Highway Act of 1944.

(b) The Federal-aid highway system as now constituted and approved, with such revisions as may be approved. Transfers, if conditions warrant, may be made between the systems.

Secondary Road System

(c) A system of principal secondary and feeder roads as required by section 3(b) of the Federal-Aid Highway Act of 1944. The roads selected shall be roads not included in the Federal-aid highway system and shall be exclusively within "rural areas," except that in States which have a population density exceeding 200 per square mile, roads and streets within "urban areas" may be included. The system so selected in cooperation with local road officials shall be submitted to the Commissioner of Public Roads in the form required by him and shall be subject to his approval.

The manner of cooperation with county, municipal, or other appropriate local road officials to meet the requirements of section 3 (b) of the Act shall be determined and exercised by each State highway department.

1.5 Establishment of "urban area" boundaries. Prior to the inclusion in a proposed program of any project involving funds authorized for urban areas, the boundaries of the particular urban area or areas involved shall be submitted by the State highway department and approved by the Commissioner, in accord with the terms of the Act. Projects in urban areas for which the boundaries have been established may be approved prior to the determination of the boundaries of all urban areas within a State.

1.6 Programs of proposed projects. Each State highway department shall prepare and submit to the Commissioner for approval detailed programs of proposed projects for the utilization of any apportionment of funds made to the State under the provisions of the Act. These programs shall be in such form and shall be supported by such information as the Commissioner may require.

1.7 Project statements. (a) A project statement, on a form furnished by the Commissioner, may be submitted for the whole or a substantial part of a continuous route embraced in the Federal-aid highway system or in the system of principal secondary and feeder roads selected or designated in accordance with the provisions of the Act.

(b) Each project statement shall be accompanied by such information as the Commissioner may require, including a sketch map in sufficient detail and covering such length of road as may be necessary to determine the fitness of the general location for improvement on the road system of which it forms a part.

(c) The Commissioner shall not authorize the advertisement of any project and shall not concur in the award of any contract for any project until the project statement has been approved.

1.8 Surveys, plans, specifications and estimates. (a) Surveys, plans, specifications, and estimates for all projects shall be prepared by or under the immediate direction of the State highway department and shall show in convenient form and detail the work to be performed and the probable cost thereof, all in conformity with the standards governing form and arrangement prescribed by the Commissioner.

(b) The State highway department may utilize the services of well-qualified and suitably equipped engineering organizations of counties, municipalities, or other local subdivisions, acting under its direction, for making surveys, preparing plans, specifications, and estimates, and for supervising the construction of any project. Inasmuch as the Act requires each State to maintain at its own expense a State highway department having adequate powers and suitably equipped and organized to discharge the duties required, no part of the cost of maintaining the central office of a State highway department or the central office of any publicly maintained engineering organization which may be utilized by the State shall be paid with Federal funds.

The State highway department may utilize the services of the engineering organizations of the affected railroad companies for railway-highway crossing projects subject to the same limitations as to the general overhead costs.

The services of private engineering organizations and of consulting engineers may be utilized on the basis of contracts for work of an unusual character requiring specialized knowledge and experience.

(c) Until plans, specifications, and estimates for a project or part thereof have been submitted and found satisfactory by the authorized representative of the Commissioner, and the State has been so notified, no project or part thereof shall be advertised for contract.

(d) If any part of the cost of a project is to be provided by a county, municipality, or other local subdivision of a State, the State highway department shall determine the official actions to be taken by, and shall enter into such agreements with, the appropriate local officials as the department shall find desirable to safeguard its responsibility under the Act for the fulfillment of the project agreement and the continuous maintenance of the project.

1.9 Project agreements. (a) A project agreement between the State highway department and the Commissioner shall be executed for each project on a form furnished by the Commissioner. No payment on any project shall be made by the United States unless and until such agreement has been executed, nor on account of costs incurred prior to authorization by the authorized representative of the Commissioner.

(b) Subsequent to execution of the project agreement no change shall be made which will increase the cost of a project to the Federal Government or alter its termini, type, or other conditions except upon agreement with the Commissioner.

1.10 Construction and contracts (a) Actual construction work shall be performed by the contract method unless another method is recommended by the State highway department and approved by the Commissioner for the reason that, under the circumstances, the interests of the public will be served, or that the proposed work is of a character not adapted to normal contract procedures. Before any work is undertaken by direct labor, the State highway department shall determine that the organization that is to undertake the work is able and equipped to perform such work at reasonable costs and favorably comparable with similar contract work.

Control Over Acceptance

(b) No part of the Federal money set aside on account of any project shall be paid until it has been shown to the satisfaction of the Commissioner that adequate methods, either advertising or other devices appropriate for the purpose, were employed, prior to the beginning of construction, to insure economy and efficiency in the expenditure of such money. An advertising period of two weeks may be accepted, provided a suitable mailing

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list of contractors is maintained by a State highway department to whom notices of new work are mailed, and public advertising is inserted at least once a week for two weeks in such publications as will insure adequate publicity, the first insertion to be two weeks prior to the opening of bids. In case of emergency an advertising period of less than two weeks, or another method insuring competitive prices, may be approved.

(c) All contracts for the construction of highways under the Act shall require the contractor to furnish all materials entering into the work, except as otherwise authorized by the prior approval of the Commissioner. No requirement shall be contained in any contract entered into by any State providing price differentials for, requiring the use of, or otherwise discriminating in favor of materials produced within the State.

(d) No procedure or requirement shall be approved which, in the judgment of the Administrator, is designed or may operate to prevent the submission of a bid by, or the award of a contract to, any responsible contractor, whether resident or nonresident of the State wherein the work is to be performed, such as laws or regulations which require the licensing of a contractor before he may submit a bid or which prohibit the consideration of a bid submitted by a contractor not so licensed, or rules which govern the pre-qualification of contractors by which the amount of work that may be awarded to a contractor is limited otherwise than by a full and appropriate evaluation of his experience, equipment, financial resources, and performance of record.

(e) No contract for any project or part thereof shall be entered into or award therefore made by any State without prior concurrence in such action by the Commissioner, and no alteration in the contract subsequently shall be made without the approval of the Commissioner.

(f) Where bids for a project are received on alternate types of construction, the award of contract shall be made to the responsible bidder submitting the lowest acceptable bid irrespective of type, unless it be satisfactorily shown that it is in the public interest to accept a higher bid.

(g) All contracts for projects under the Act shall contain suitable stipulations designed to insure that the contractor shall perform with his own organization not less than 80 per cent of the work, exclusive of items not commonly found in contracts for similar work, or which require highly specialized knowledge, craftsmanship, or equipment not ordinarily available in contracting organizations which perform work of the character involved. A contractor who states in his proposal a particular item or items which he proposes to sublet, and names the subcontractor to whom he proposes to sublet such work, may, if such item or items do not constitute the major item or items of the contract, have such item or items performed by the subcontractor named.

Materials Kept "Open"

(h) No part of the money apportioned under the Act shall be used, directly or indirectly, to pay or to reimburse a State, county, or local subdivision for the payment of any premium or royalty on any patented or proprietary material, specification, or process for a distinctive type of construction unless purchased or obtained on open actual competitive bidding at the same or a less cost than unpatented articles or methods, if any, equally suitable for the same purpose: Provided, however, that patented or proprietary articles or methods of reasonable cost which constitute minor elements of a contract item may be specified and paid for if purchased in competition with one or more equally suitable patented or proprietary articles or methods or if information is included in the advertisement stating the price at which such patented or proprietary articles or methods are available to all contractors. Manufactured patented or proprietary articles which constitute a major part of the cost of a contract item may be specified and paid for if competition is assured with unpatented or nonproprietary articles or between two or more manufactured patented or proprietary articles accepted as equally suitable for the same purpose. Nothing in this section shall be construed as a prohibition against the use of any patented or proprietary material, specification, or process for a distinctive type of construction on relatively short sections of road for experimental purposes.

(i) Construction engineering and inspection charges reimbursable with Federal funds shall be limited to the salaries of individuals directly employed on a project and to other necessary costs incurred in connection with such engineering and inspection.

(j) Where a public or private utility occupies a public highway right-of-way and the facilities of such utility have to be moved, adjusted, or changed because of the construction of a project, the State highway department shall make a formal finding as to the extent that such utility is required to move, adjust, or change its facilities at its own expense, or is relieved of that obligation by law or otherwise. The Commissioner will determine in all such cases whether reimbursement from Federal funds may be made. Reimbursement from Federal funds in any case shall not exceed the regular Federal pro rata share of the cost of such work actually paid by the State or its subdivisions. Work for the necessary adjustment of public utility facilities in connection with the construction of a project may be undertaken, if so determined by the State highway department, by the utility concerned on a force account basis. Maintenance of railroad traffic, including temporary support trestles, track adjustments, signal installations and adjustments, the rearrangement of telegraph and telephone lines on railroad rights-of-way, and the adjustment of existing drainage facilities, may be undertaken by the railroad or other utility involved, by agreement with the State highway department. Any material furnished by a railroad company or other utility for temporary work will be reimbursed at actual cost less fair salvage value when the material is released.

1.11 Roadside improvements. To insure proper treatment of the roadsides, to eliminate insofar as possible the scars of construction, and to provide footpaths or other safety facilities, the project agreement shall prescribe what part of the work of this character is to be performed as a part of the original construction of a project and what part, if any, at a later date.

1.12 Right-of-way. Federal participation in right-of-way shall be restricted to costs of new or additional lands required and acquired subsequent to July 13, 1943, and subsequent to the date of approval of the program which includes the project for which such right-of-way is acquired. Payment will not be made for any land owned by a State or its subdivisions that is not acquired for and used as a part of the right-of-way for such project, but payment may be made in proper cases for the readjustment, repair, or restoration of facilities and improvements on such publicly owned lands made necessary by reason of the construction of the highway project thereon. Only such right-of-way costs as are paid from public funds of the State or its subdivisions shall be eligible for reimbursement.

1.13 Labor and employment. (a) No convict labor shall be employed and no materials manufactured or produced by convict labor shall be used on any project constructed under these regulations.

(b) If a local employment service is maintained by the Federal Government, or by the Federal Government

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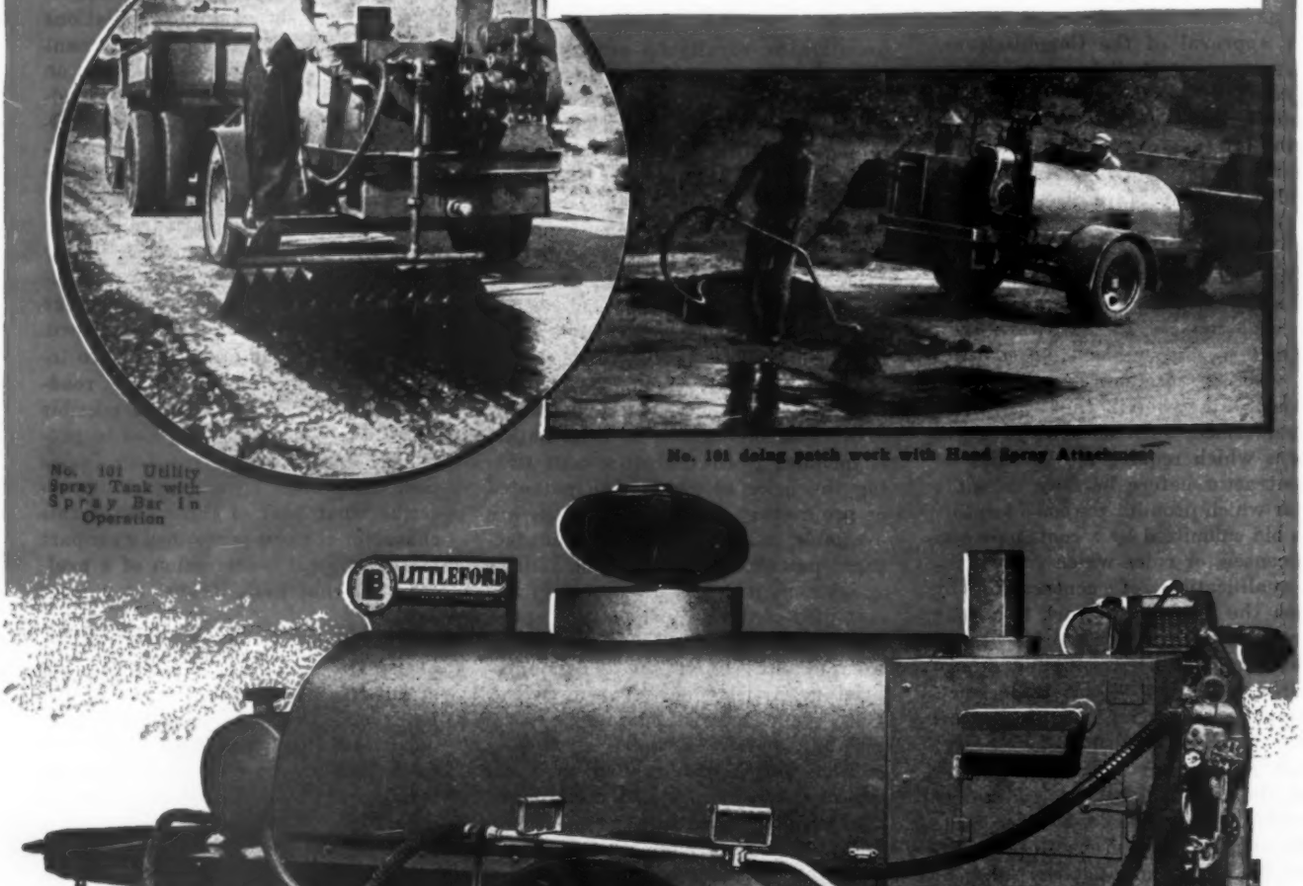

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in cooperation with the State, in the vicinity of any work undertaken under the Act, the contract may require that unskilled labor for a project shall be selected from qualified workers referred by such agency.

(c) To prevent the exploitation of labor all contracts shall prescribe the minimum rates of wages for skilled, intermediate, and unskilled labor, as predetermined by the State highway department, which contractors shall pay, and such minimum rates shall be stated in the specifications advertised in the call for bids on the proposed project.

(d) All contracts for the construction of projects shall require that the wages of all labor shall be paid in legal tender of the United States. This condition will be considered satisfied if payment is made by a negotiable check on a solvent bank, which may be readily cashed by the employee in the immediate community for the full amount, without discount or collection charges of any kind.

1.14 Highway planning and research projects. Each State highway department shall prepare and submit a detailed program of proposed engineering and economic investigations and highway research necessary in connection therewith, showing the amount of Federal and State funds proposed for expenditure on each item of the program. The program shall be subject to the approval, project statement, and project agreement procedure provided for construction projects. Pending the submission and approval of a final program 1½ per centum of the total apportionment to each State shall be reserved for highway planning and research projects.

1.15 Railway-highway crossing projects. (a) Before a project for the elimination of hazards at a railway-highway crossing shall be approved for construction an agreement shall be entered into between the State highway department and the railroad concerned for the construction and maintenance of such project. For each such project financed in whole or in part from funds provided under the Federal-Aid Highway Act of 1944 an estimate of the total benefits to the railroad and of anticipated contributions of every kind from the railroad, with supporting data, shall be submitted with the plans, specifications, and estimates and such estimate of benefits and contributions shall be included in the agreement between the State highway department and the railroad.

(b) State laws pursuant to which contributions are imposed upon railroads for the elimination of hazards at railway-highway crossings shall be held not to apply to Federal-aid projects.

1.16 Coordination of airport and highway location. Federal highway funds shall not be used for the reconstruction or relocation of any highway giving access to, or closed or impaired by, an airport hereafter constructed or extended, unless, prior to such construction or extension, the State highway department and the Public Roads Administration have concurred with the officials in charge of the airport that the location or extension of such airport and the consequent reconstruction or relocation of the highway are in the public interest.

1.17 Maintenance of projects. (a) Maintenance of all projects constructed under the provisions of the Act shall be the responsibility of the State except for those projects or portions thereof which may be eliminated from the Federal-aid highway system or from the system of principal secondary and feeder roads through relocation in connection with further improvement of a project. The State highway department, acting under the laws of the State, may provide for maintenance of Federal-aid projects by agreement with municipal or other local authorities, but the responsibility of the State to maintain such projects satisfactorily remains unchanged under the requirements of section 14 of the Federal Highway Act.

Local Maintenance Problem

(b) A project for which the State highway department proposes to provide maintenance by an agreement with a municipality or a county shall not be approved if any project previously improved with Federal funds under the provisions of the Federal Highway Act, as amended and supplemented, which the said county or other subdivision has agreed to maintain, is not being satisfactorily maintained as determined by the Commissioner.

1.18 Traffic signs and signals. (a) All signs and traffic-control devices and other protective structures, whether paid for from Federal or other funds, erected on or in connection with highways or structures on which Federal funds are expended, shall be in conformity with such manual of uniform traffic-control devices as may be adopted by the American Association of State Highway Officials, approved by the State highway department, and concurred in by the Commissioner.

(b) The rights-of-way provided for Federal-aid highway projects shall be held inviolate for public highway purposes and no signs (other than those specified in paragraph (a) of this section), posters, billboards, roadside stands, or other private installations shall be permitted within the right-of-way limits.

1.19 Diversion of gasoline and motor vehicle taxes—reduction of apportionment. If the Administrator shall find at any time that lesser amounts of the revenues derived from State motor vehicle registration fees, licenses, gasoline taxes, and other special taxes on motor vehicle owners and operators in any State are required by its laws to be applied to highway purposes than were required to be so applied by the laws of such State on June 18, 1934, he shall take such action as he may deem necessary to comply with the provisions of section 12 of the Act of June 18, 1934 (48 Stat. 995), by reducing the apportionment of Federal funds to such State by not to exceed one-third of the amount to which it otherwise would be entitled for any fiscal year in which such finding may be made.

1.20 Records and cost keeping. (a) Such records of the cost of construction, of inspection, of tests, and of maintenance done by or on behalf of the State, shall be kept, by or under the direction of the State highway department, as will enable the State to report, upon the request of the Commissioner, the amount and nature of the expenditure for these purposes.

(b) The accounts and records, together with all supporting documents, shall be open at all times to inspection by the Commissioner, or his authorized representatives, and copies thereof shall be furnished when requested.

1.21 Payments. Vouchers in the form provided by the Commissioner and certified as therein prescribed, showing amounts expended on any project and the amount claimed to be due from the Federal Government, shall be submitted by the State highway department to the Public Roads Administration, either after completion of the project or as the work progresses.

1.22 Advance of funds. If necessary to enable any State highway department to make prompt payment for work as it progresses and thereby insure expeditious completion of projects, the Commissioner may advance the Federal share of the cost of such projects to any State that does not after June 30, 1945, divert to other than highway uses road-user revenues in violation of section 12 of the Act of June 18, 1934 (48 Stat. 995). Such advances shall be made in such manner and subject to such conditions as may be prescribed by the Commissioner.

1.23 Delegation of authority. In carrying out the provisions of the Act, the Commissioner is hereby au-

thorized to delegate such of the duties and responsibilities imposed upon him to such official or officials of the Public Roads Administration as in his judgment will result in economy and efficiency in effectuating the purposes of the Act and of these regulations.

1.24 Operating procedures and instructions. The Commissioner is hereby authorized to issue such operating procedures and instructions not in conflict with the Act or with these regulations as he may deem necessary for carrying out the provisions and effectuating the purposes of the Act and these regulations, and all such operating procedures and instructions issued by him shall be and continue in full force and effect from the date on which issued or made effective until modified or revoked by him.

1.25 Application of regulations. These regulations shall apply to all provisions of the Act and to all classes of projects thereunder, shall take effect upon approval, and shall supersede the rules and regulations approved by the Secretary of Agriculture Feb. 27, 1935, the rules and regulations approved by the Secretary of Agriculture Jan. 13, 1939, and the rules and regulations approved by the Secretary of Agriculture April 11, 1939.

Number of Grades of Asphalt Limited

The Petroleum Administration for War has issued Directive No. 80, effective May 1, under which refiners can manufacture only the following grades of asphalt or asphaltic products for paving purposes or for dust palliatives:

Asphalt Cements:

Penetration Ranges—50-60, 60-70, 70-85, 85-100, 100-120, 120-150, 150-200, 200-300.*

Federal Specifications — SS-A-706b (November 10, 1943) and SS-R-406a (April 25, 1942).

*At purchaser's option, penetration may be 200-250 or 250-300.

Medium Curing Cutback Asphalts: MC-1, MC-2, MC-3, MC-5.

Federal Specifications — SS-A-671a (June 20, 1941) and SS-R-406a (April 25, 1942).

Rapid Curing Cutback Asphalts: RC-1, RC-2, RC-3, RC-4, RC-5.

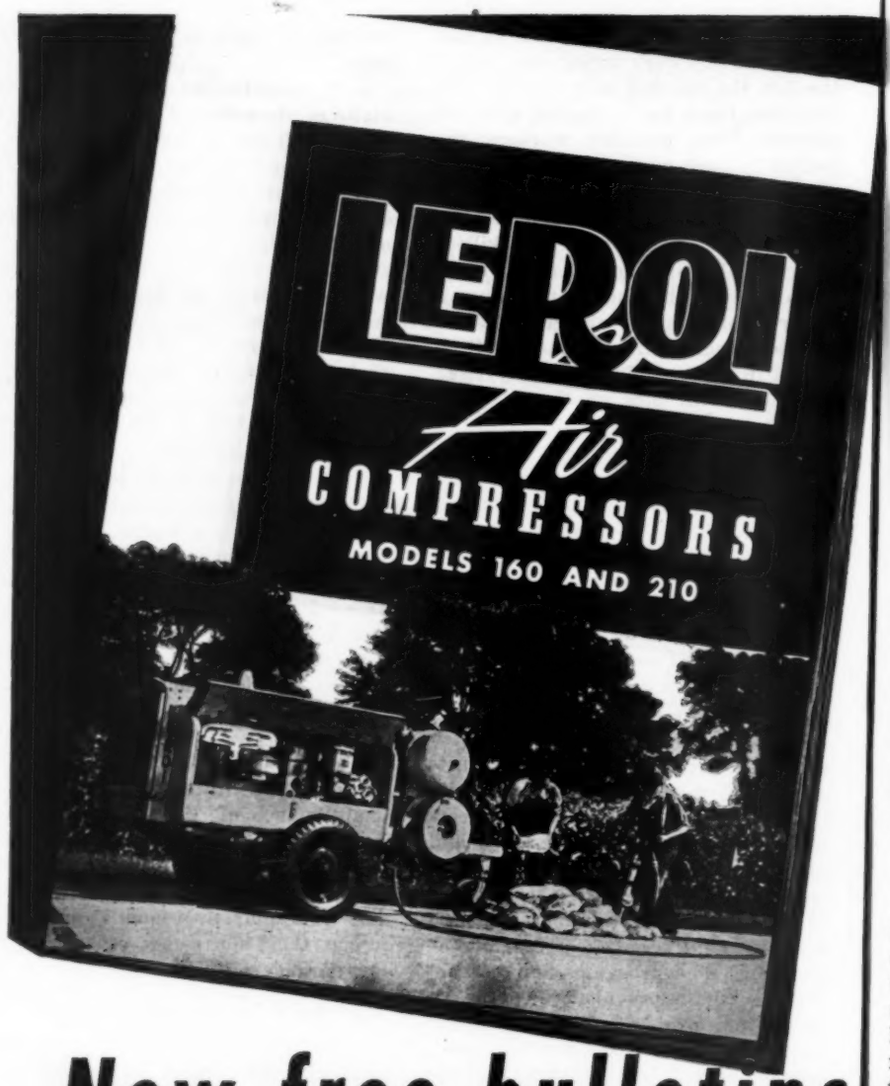
Federal Specifications — SS-A-671a (June 20, 1941) and SS-R-406a (April 25, 1942).

Emulsified Asphalts:

Any grade manufactured from base stocks provided for in this Directive.

Road Oils: (Applicable in all states except those states where the delivery and use of road oil is prohibited or limited.)

SC-1, SC-2, SC-3, SC-4 and SC-5.



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Secondary Roads Need Action Now

By CHARLES M. UPHAM
Engineer-Director, American Road Builders' Association

AMERICA'S 2,400,000 miles of secondary or farm-to-market roads have long been the Cinderella of our federal highway support. While her handsome sisters, the broad trunk lines that span the continent and the state highways that link the great centers of population, have for decades received government funds for their improvement and extension, the county road has waited in the dust and mud for a Prince Charming to come along.

Now, as in the nursery tale, things are going to be different, and the Federal-Aid Highway Act of 1944 is in the role of the Fairy Godmother. For the first time in history, Congress takes cognizance of the roads which serve 6,000,000 farms and out of the $500,000,000 a year authorized for the first three postwar years, it allocates $150,000,000 for secondary highways.

Where will matching funds come from for F. A. secondary roads? What new administrative machinery for these roads? Engineering standards? All states are not making equal progress on these urgent problems. This excellent county road in Ionia County, Mich., is being given springtime working over to re-mix and re-shape the calcium chloride stabilized clay-gravel surface

Funds Must Be Matched

It is provided in this act that the funds authorized are to be matched dollar-for-dollar by the states and their political subdivisions, which means, of course, the counties. At long last, the long-neglected country road is in the picture, but it does not follow that everything is smooth sailing from this point on. There are two important things which must be done before the farmer can hope to drive his automobile or truck into town without danger of being bogged down.

The first step is for the several states to provide the matching money for participation in the federal grant. As has been pointed out, the Federal-Aid Highway Act of 1944 made history. It went farther than any previous legislation had done—taking in the farm-to-market roads, including municipalities and allowing funds for the purchase of rights-of-way. Some of our states are not geared to accept this aid under their present laws, and new ones must be passed or old ones amended to secure their allotment. It is almost unthinkable that any state would neglect this opportunity; but states, like individuals, have been known to err through delay, stagnation or opposition.

"What of My State?"

A pertinent question for every highway user in America to ask today is—what is my state doing about it? He should know, too, where to get the answer. It is in his own state legislature.

But with the state's financial machinery ready to function, there remains the second essential step which must be taken. That is the preparation of a program and the making of plans. This takes time, and the time to do it is at once. The postwar highway program is intended to provide jobs for millions of returning service men. It won't be long now before those jobs will be needed.

While the highway user is in a questioning mood he might ask what are the state, county and municipal highway officials of my state doing to provide this shelf of postwar highway projects? The Fairy Godmother transformed the pumpkin and mice into a beautiful coach with white horses merely by waving her magic wand. We can't expect highway officials to match that, but American skill and ingenuity need not depend on miracles once they are applied to a task.

The kind of plans needed are the plans that have progressed through the blueprint stage—the kind that can be advertised in the newspapers tomorrow. It is not enough to muse that "we ought to resurface that stretch" or "we should have a new road here." There is nothing in such wishful thinking to help the farmer, the mail carrier, the school bus driver and all the rest who have to use these country highways. We must have rights-of-way and the engineering details on paper before we can start to move dirt.

That is why the American Road Builders' Association urges immediate action all along the line in order that the postwar program may do what it is intended to do—relieve unemployment, stimulate business and help stabilize the national economy. VE-Day has come and gone—but for many localities there will be a long period before actual construction can begin. Road building should commence just as soon as the volume of manpower, released by the armed forces and by war industry, justifies it. Some states have made excellent progress toward this goal but the plans of others, I regret to say, are still in the dream stage.

Under the act, county and municipal highway officials must integrate their local plans with that of the state.

(*Continued on page* 91)

DOLLARS DOWN TO EARTH

BUDGET-SAVERS—these Blue Brutes! When postwar construction plans come down to earth, they'll keep down costs on jobs like this:

> *Pittsburgh's $36,000,000 public works program including $4,719,550 for water mains, $9,142,500 for streets, $3,494,000 for sewers.*

Other cities, too, have made substantial plans. Blue Brute air-power teams will back your effort then — and they'll help you, right now, on those jobs that call for sure power, free from time-wasting trouble.

Compressors, like the 210′ model shown above . . . Diesel, gasoline or electric driven . . . all have Feather* Valves — strongest, lightest, tightest, *proved* good for a lifetime — 3-point suspension of engine and compressor for rigid alignment — full force feed lubrication — and other trouble-savers.

Air tools — clay diggers, sheeting drivers, paving breakers — tools for *every* construction purpose — are better designed for sturdier, smoother action, easier handling!

Look 'em over now; plan now to get more worth from air with Worthington. Your nearest Blue Brute distributor is listed on page **81.**

*Reg. U. S. Pat. Off.

H5-3

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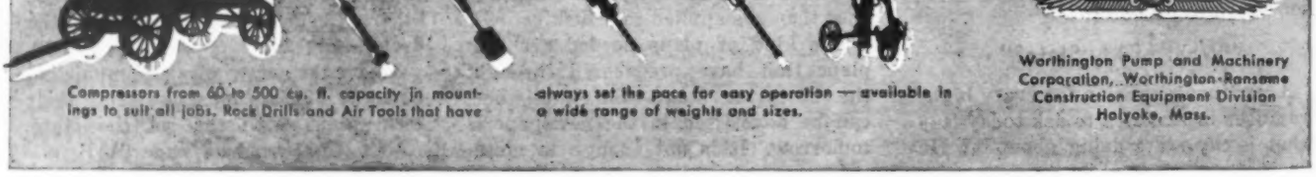

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History That Is Not "The Bunk"

By HALBERT P. GILLETTE

"HISTORY", said Henry Ford a generation ago, "is the bunk". He was right as to much that is taught in schools, if by "bunk" he meant useless. Herbert Spencer, the philosopher of evolution, expressed the same opinion half a century earlier in his essay on Education. But there is a sort of history that is not "the bunk". I mean the history of economic experiments by politicians, the practices of trade guilds and labor-unions, and much more of like kind.

Among early political experiments in ancient Rome, for example, there was the giving of farm lands to soldiers after the end of a war followed by the discovery that a good archer or charioteer did not relish farming and soon quit. Some of our Congressmen might study to advantage that kind of history, for there is talk of reclaiming desert lands to be given to some veterans, and of loaning money to others who would like to launch new businesses. History of the kind not found in textbooks has a lot to say about the failures of paternalistic ventures of that sort.

The same untaught and seldom read history abounds in records of governmental regulations of wages and commodity prices. In Thorwald Rogers' "History of Agriculture and Prices in England, 1259 to 1793" the fifth volume tells of the degradation of the English laborer for three centuries following the enactment of the "Statute of Labourers" in 1351. That law prescribed that wage rates should not exceed those prior to 1348 when the Black Death killed about a third of the population, and caused a scarcity of workers. Wages were fixed by justices of the peace, and the result was a labor "black market" and endless migrations from one region to another. At the same time the government regulated the prices of foods —or tried to—so that workers would not complain because their wages were controlled. But the old "law of supply and demand", which could not be entirely squelched, and the older law of freedom to bargain with employers, finally brought the "Statute of Labourers" to an ignominious end.

Right after the last World War I studied Thorwald Rogers' great treatise, above mentioned, and that of Thomas Tooke on "History of Prices", to see how previous wars had affected wages and prices in England. I found that inflation of currency had occurred after early wars, followed by inflation of wages and prices. Beginning about A.D. 1350 and ending two centuries later, a series of kings practiced the art of "clipping the coins" of the realm on a grand scale. The original silver "pound sterling" was "Tower-weight", but by 1550 it had shrunk in weight to about one-third of a pound! You see, when a king got around to paying back silver borrowed to finance a war, he found it "economic" to decree that the weight of the pound had been reduced so and so much. The result was an increase in the number of pounds in circulation, and a corresponding increase in wages and prices. Nowadays governments only occasionally "clip coins", but accomplish the same result, even when not intentionally, by "printing money" on a grand scale. Then they are astonished when prices rise and workers ask for higher wages. They argue that, by purchasing federal bonds to finance the war, inflation can be prevented, but ignore the fact that the money thus loaned to the government remains in circulation. Moreover the purchase of federal bonds by banks is followed by an increase in Federal Reserve currency notes issued to banks. If firemen were to squirt gasoline on a blaze, while calling on by-standers to aid in stopping it, the act could be no more senseless than the appeals to citizens to stop inflation.

▼

Illinois Gets Airport Authority Act

Governor Green recently signed into law a new airport authority act designed for ultimate use by more than 125 downstate Illinois cities to finance and operate landing fields.

None of the communities, however, intends to go ahead with plans until the state Supreme Court gives the signal.

Only a dozen cities in the 5,000 to 500,000 population group can utilize the law within the next two years. Others don't have the necessary guarantee in federal funds to pay one-fourth of airport project costs, so they will have to wait until 1947.

Here are the law's salient provisions:

Referendum approval is necessary to establish an airport authority.

The authority can tax 15 cents per $100 valuation, issue bonds up to 1%

(*Continued on page* 88)

Where We Are in Airport Design

By HAROLD J. McKEEVER
Editor, Roads and Streets

What present and future plane loadings must be considered airport design? What are some of the typical layouts, dimensions, grades and other details of latest practice? What soil classification, subgrade evaluation and design procedures are now used in flexible and rigid pavement design? What fundamentals and trends can be highlighted in drainage practice? Herein are the concluding chapters of an article on this timely subject, based on a paper prepared for the Airport Engineering and Construction Session, Annual Convention of the American Road Builders' Association, held recently in Chicago. (First chapters, April, 1945, R&S.) The full paper will be available subsequently in the ARBA Convention Proceedings and is also being preprinted at this time and distributed by the Association along with other airport papers given at the meeting.

V. Rigid Pavement Design

The design of airport concrete pavements is today based by all agencies on an empirical application of the formula developed by H. M. Westergaard, or a modification. This formula doesn't consider temperature variations or other influences that tend to change volume, effect of thickened edge, effect of local irregularities in subgrade support, and other stress influences. A design factor is chosen to provide a pavement thick enough to withstand design stresses at interior corners under given conditions of load repetition.

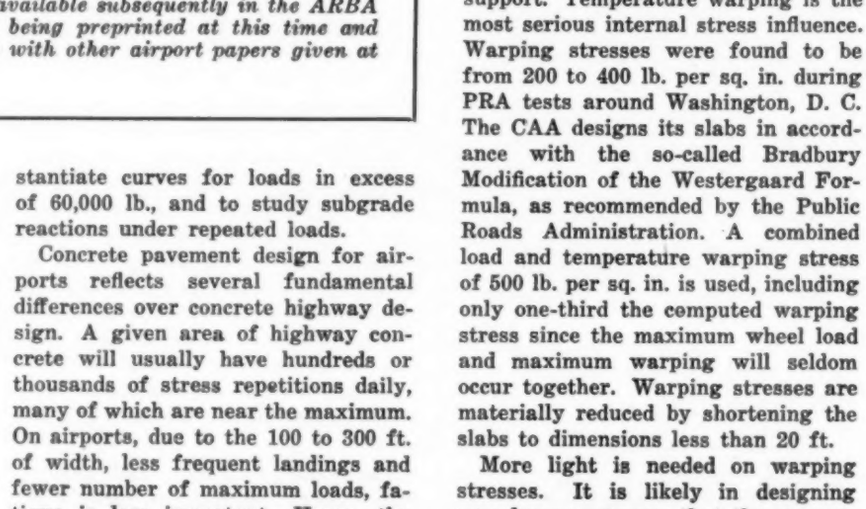
Typical curves used by Army engineers for selecting interior slab thickness for specified working stresses are shown in the accompanying design curve. These curves are based on a modulus of soil reaction "k" determined by field plate bearing tests. For example, a 60,000-lb. wheel load on a soil having a modulus of 300 (a very good compact subgrade having bearing value equivalent to about 30 lb. per sq. in.) calls for 7 in. of concrete. This agrees closely with Portland Cement Association Design Stress tables published in 1942, which give 437 lb. of stress assuring 65 lb. fire pressure, and indicates a permissible ample strength for handling a capacity number of maximum plane loads daily for a 30-year theoretical pavement life. This also indicates a design factor of 1.60. The Corps of Engineers uses 1.40 design factor for limited operation fields and 1.75 for normal service as its general design basis, assuming 700 lb. ultimate flexural strength, compared to a factor of 2.00 necessary for safe highway slab design.

Further research is needed to substantiate curves for loads in excess of 60,000 lb., and to study subgrade reactions under repeated loads.

Concrete pavement design for airports reflects several fundamental differences over concrete highway design. A given area of highway concrete will usually have hundreds or thousands of stress repetitions daily, many of which are near the maximum. On airports, due to the 100 to 300 ft. of width, less frequent landings and fewer number of maximum loads, fatigue is less important. Hence, the lower permissible factor of safety. Impact is also less of a factor in runways.

CAA engineers design rigid slabs on an analytical basis which takes into account these differences. Their method places greatest importance on the exterior loads, the natural stresses within the concrete, and the subgrade support. Temperature warping is the most serious internal stress influence. Warping stresses were found to be from 200 to 400 lb. per sq. in. during PRA tests around Washington, D. C. The CAA designs its slabs in accordance with the so-called Bradbury Modification of the Westergaard Formula, as recommended by the Public Roads Administration. A combined load and temperature warping stress of 500 lb. per sq. in. is used, including only one-third the computed warping stress since the maximum wheel load and maximum warping will seldom occur together. Warping stresses are materially reduced by shortening the slabs to dimensions less than 20 ft.

More light is needed on warping stresses. It is likely in designing very heavy runways that the stresses



TYPICAL PAVING SECTION

This section shows a repaving of existing runways raising the allowable wheel load from approx. 8,000 Lbs. to 50,000 Lbs.

Navy strengthening design, using a leveling course and 10-in. concrete slab, which raised load capacity of old asphalt paving from 8,000 up to 50,000 lb.

will prove to be relatively less due to the insulating effect of thick slabs against 24-hour top cooling and warping cycles.

Slab Details—Concrete pavements are commonly designed to the nearest inch. While theoretically a 5-in. concrete slab is of sufficient thickness for certain airfield conditions, all authorities are disposed to be more conservative. Most designs begin at 6 in., with slabs now ranging up to 12 in. or more in thickness on a few bomber bases and air terminals.

Prevailing practice today calls for pavements thickened at free sides and at longitudinal expansion joints, excepting for slabs of 8 in. or more which frequently are given a uniform cross section. Use of the thickened edge, while theoretically desirable and necessary on 6-in. designs to provide space for keying, creates difficulties in the way of uniform subgrade compaction. And thickened edges sometimes impede subgrade drainage during construction.

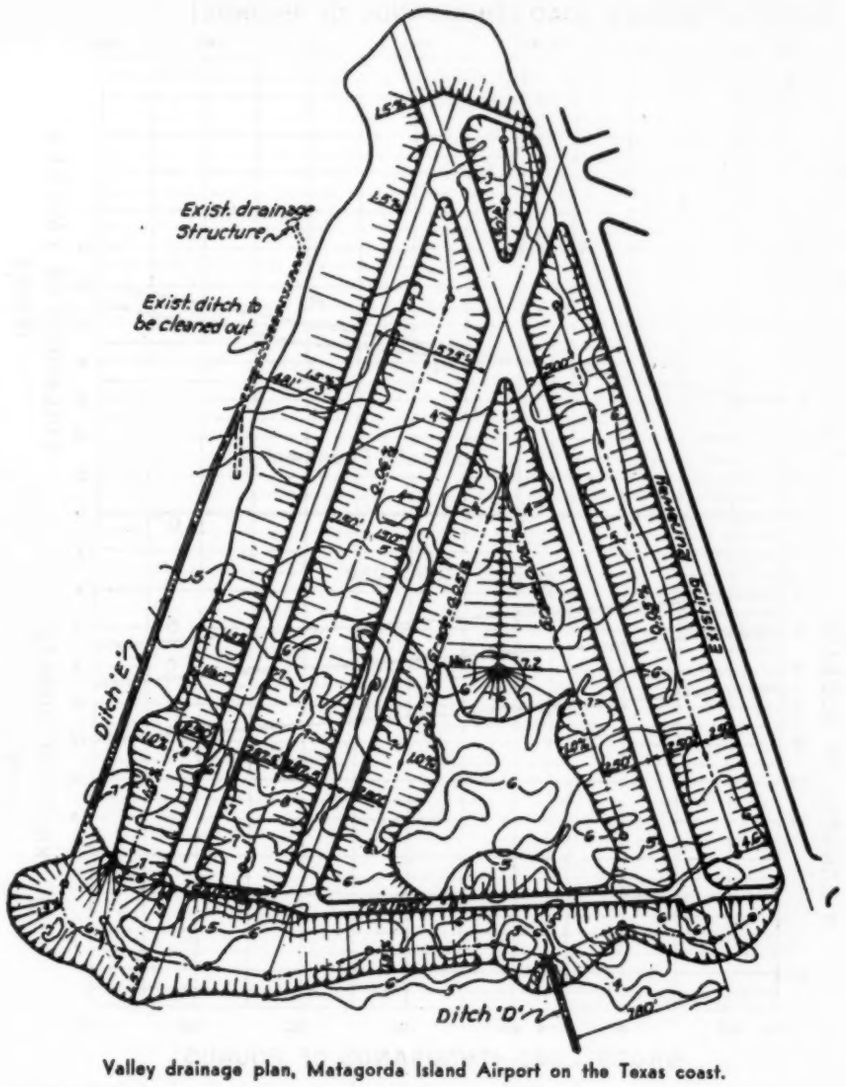
CAA design thicknesses for heavier loadings are made somewhat less than the theoretical, due to the likelihood that few planes will be in the heaviest class.

All agencies now agree that taxiways, runway ends and aprons require thicker pavements than runways to resist vibration of standing planes and to meet greater stress repetition. The CAA arbitrarily adds an additional inch while the Army designs for 25 per cent higher load.

Load transfer across joints continues to be a subject of concern, and there is a diversity of practice in the use of dowels across contraction joints. The Navy and the CAA, for example, call for doweling of all transverse dummy joints as well as transverse expansion joints, and the Corps of Engineers provides alternate designs using either keys or dowels. The CAA uses steel across all dummy joints both transverse and longitudinal as well as across expansion joints. It is to be noted, however, that the present Navy practice with regard to doweling transverse contraction joints is undergoing study, the results of which, however, are not yet complete.

Construction keys have not always acted satisfactorily as load transfers due to poor quality of concrete, and the Corps of Engineers disposition is to use fewer keys.

Joint spacing is left somewhat to the judgment of the local engineers because of the many factors involved. A 150-ft. runway will usually have an expansion joint along the center line. Pavements will have expansion joints at 75 to 100 ft. intervals longitudinally and 50 to 100 ft. transversely under Corps of Engineers rules, with dummy joints usually at 20 ft. or less.

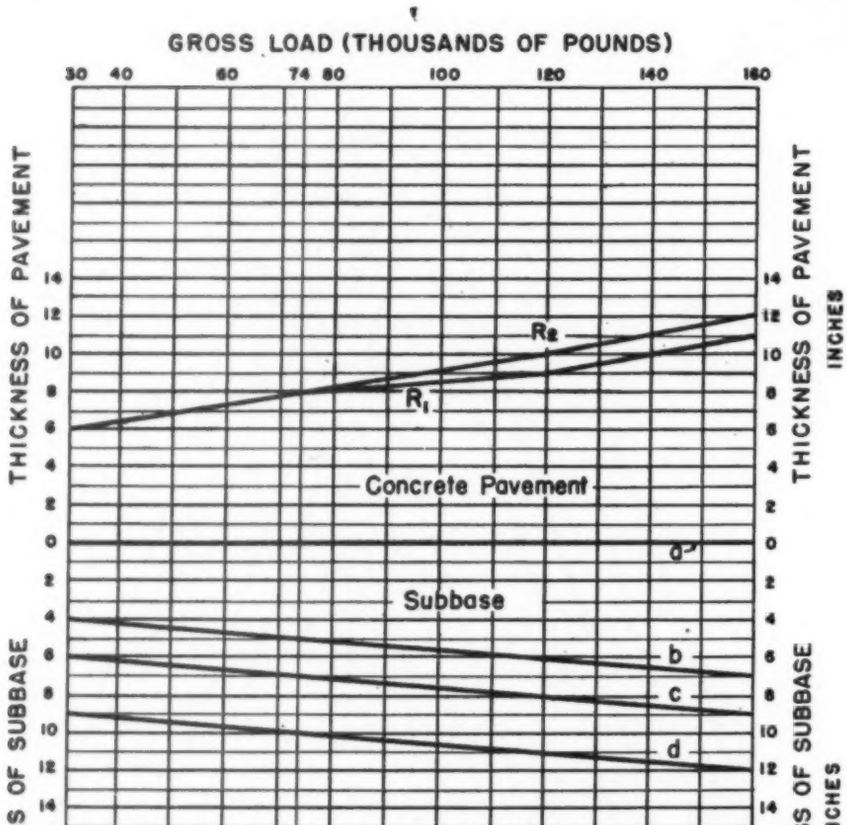


Valley drainage plan, Matagorda Island Airport on the Texas coast.

Base Design — Subgrade moduli commonly assumed by highways would result in concrete pavements 10 to 14 in. thick for heavy planes. This fact together with the better quality of concrete obtainable in thinner slabs and the need to hold down warping stresses, have resulted in a tendency to hold slabs to 8 or 9 in., specifying a high quality base material. A good base helps limit moisture content, the chief cause of pavement failures. Rolled base courses of granular material are less likely to go bad under adverse moisture or load conditions. They help assure uniformity, insulate the subgrade, and provide against frost heave or excessive capillary rise. But due to the effect of repeated deflection under load, the support values for seemingly high grade bases are not always as high as its "k" modulus would indicate. Thorough compaction of subgrade soil is hence recommended to a depth of 2 to 3 ft., and high requirements such as 95 per cent modified Proctor are specified for soils under pavement areas. Greater densities improve the performance of all subgrade materials, particularly sand.

Determination of Pavement Types—Aprons and hard standing areas are quite generally built of concrete today because of the deteriorating effects of gasoline and oil on bituminous materials and because of high shearing stresses under turns. All pavements for the new very heavy planes are usually concrete.

Design of runways, taxiways, and other surfaces in general becomes purely an economic problem of cost and service. When the choice is not clearly indicated opinion is divided between so-called rigid and flexible types and concrete; and as to bases, experience with gravel, crushed stone, slag, caliche and other granular or stony materials has shown the usefulness of a wide variety of local materials. Soil-cement has found extensive use as an economical base for light planes and as base and subbase for heavier loadings. Soil stabil-



Showing part of the slope of a fill that is 170 ft. high across the gulley (not visible) at the left. Believed to be the highest airport fill in North America

ization with calcium chloride has an important place. Surface treated base courses are used on Army fields of temporary use, and also on peripheral stub-end taxiways of major fields.

Many local factors, such as availability of good materials, transportation, climate, and drainage conditions must be considered. Where alternate types are being weighed the cost of maintenance and general performance of each type under the existing conditions should be considered along with the contractor's bid prices. Use of air entraining cement in concrete, which has been specified extensively on Army work in the northeast, for example, will have the effect of increasing the durability and lowering probable maintenance costs of concrete in climates where frost sealing was previously a matter of concern.

Similarly, other paving developments may enter into the problem of type selection. Also both grading and drainage costs may be materially affected by the type of pavement used and new service data will be available on an increasing scale as time passes. The engineer's mind, must certainly remain open.

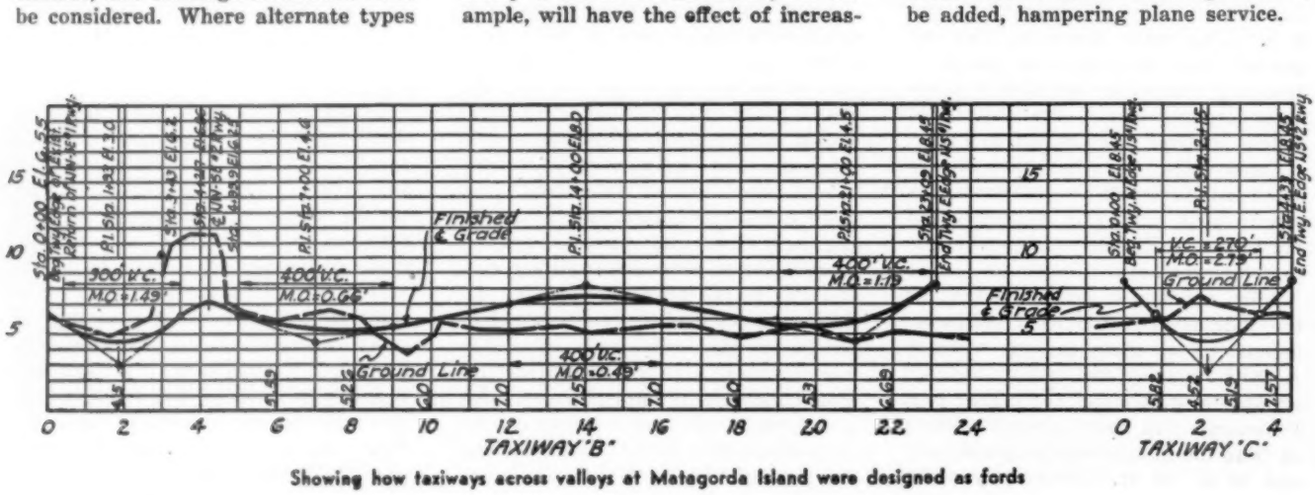
Normally at present, the Federal Airways Service of CAA designs both types and awards on low bid. CAA's average cost in place per square yard per inch of thickness for three recent years is given below:

Material	Cost Per Sq. Yd. Per In. Thickness
Subbase (sand or bank run gravel	$0.05
Caliche (used in Texas and New Mexico areas)	0.06
Crushed stone or crushed gravel	0.14
Limerock (used in Florida no frost areas)	0.16
Sand-Asphalt	0.18
Bituminous Concrete—Road Mix	0.22
Bituminous Concrete — Hot Plant Mix	0.31
Portland Cement Concrete	0.32

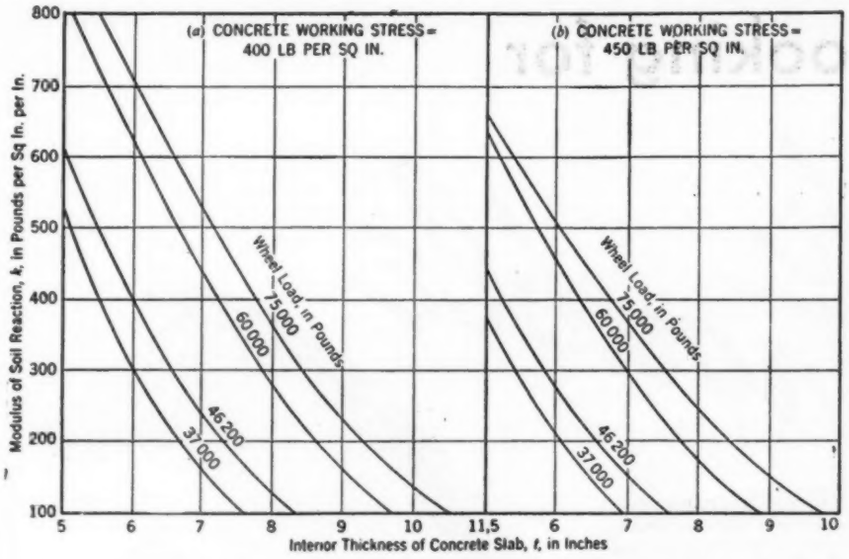
VI. Airfield Drainage Design

It goes without saying that airport pavement should have the protection of good drainage, both surface collection and ground water. Beside being necessary to protect subgrades, drainage has the job of getting surface water off of runways quickly. A sheet of water as thin as 2 in. can seriously threaten landing safety.

In the early part of the war many fields were given extensive collecting systems and subsurface drainage with little time to give the problem the detailed study it deserves. It has been said that some fields have been overdrained. Yet in more cases drainage problems were bypassed or inadequately met. During the severe winter of two years ago some southern fields became lakes. Drainage had to be added, hampering plane service.



Showing how taxiways across valleys at Matagorda Island were designed as fords


(a) CONCRETE WORKING STRESS = 400 LB PER SQ IN.
(b) CONCRETE WORKING STRESS = 450 LB PER SQ IN.
Modulus of Soil Reaction, k, in Pounds per Sq In. per In.
Wheel Load, in Pounds
75000
60000
46200
37000
Interior Thickness of Concrete Slab, t, in Inches

Design curves for determining concrete interior slab thickness as used by Corps of Engineers. Tests are under way to furnish curves for heavier loadings

Concrete box edge drains with open precast gratings, used on Moon Township Airport, Pittsburgh, Pa., along an apron and along dips in the runway profile.

So, the lesson learned is that you cannot neglect sound engineering, even in time of war. Several points need particular emphasis:

(1) Drains under pavements should be installed low enough to effectively hold down the ground water and to be amply protected from the critical loads of earth-moving equipment.

(2) It is more important to do a thorough subdrainage job than to handle peak storm water, since wet subgrades are the chief cause of pavement failure.

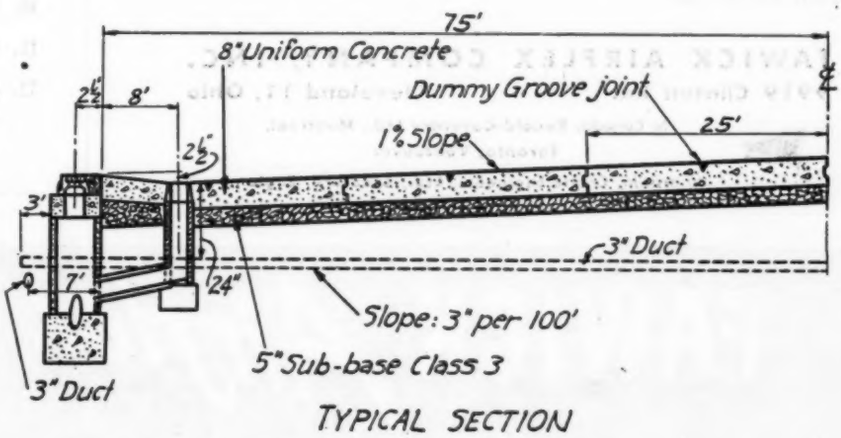
(3) Be sure the drainage outlet channel is large enough and low enough.

Too much attention cannot be given to planning of the graded areas to facilitate surface runoff. Ponding or temporary storage as a means of minimizing storm drainage and cutting drainage costs has come in for a great deal of attention of late. This subject which gets into complex considerations of hydrology and calls for a great deal of special experience and judgment, is exhaustively treated in the paper, "Design of Drainage Facilities," by Gail A. Hathaway, Office of Chief of Engineers, Proc. ASCE, Jan., 1944. Design of surface contours for ponding requires the assumption of a maximum or "design" storm intensity and the infiltration capacity of the turfed soil; also an estimate of overland flow and drop inlet capacity. The general policy is to use a 2-year storm intensity frequency maximum for temporary and a 5-year maximum for permanent fields as a basis for storm drainage design.

The author visited one Army airfield extension job on the Texas coast (Matagorda Island) which, because of its low elevation above hightide, could not have under-drains and depended entirely on "valley" drains. (See page 83.) The valleys run roughly parallel to runways and vary in width from 250 to 290 ft. and up to 4 ft. deep at the center. Side slopes are 1½ per cent and axial gradients .05 per cent to .06 per cent. Where taxiways cross valleys they are designed as concrete paved fords. In studying the problem the engineers observed that storm water would run off readily from any slope of more than 1 per cent, but that flatter areas retained water due to depressions and other irregularities in the graded surface.

Flat concrete boxes used on an earlier portion of the field filled up with sand before turf could be developed. At an adjoining field, where drainage head-room was also a problem, double lines of flat corrugated iron arches were used with success. Valleys used in conjunction were 500 to 600 ft. wide in this instance.

A subject on which there is much discussion is that of edge drains. CAA uses them on large fields, collecting pavement surface water through flat paved gutters and catch basins and collecting field runoff through direct drainage lines. On one CAA designed field (Moon Township, Pittsburgh) the author observed edge drains consisting of long concrete catch basins having open precast gratings flush with the pavement surface. This construction was used along an apron and along runways near dips in the centerline grade; in other words, where an unusual volume of surface runoff had to be collected and prevented from washing the shoulders. CAA designers have found it advisable to install shallow gutters and inlets for pavement runoff invariably



Typical drainage details, CAA airport, Danville, Va.

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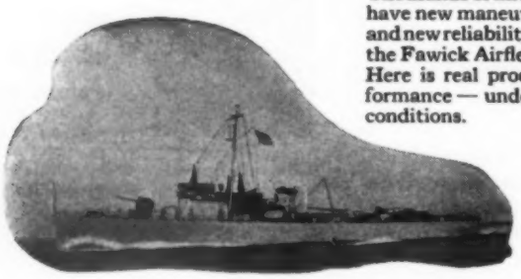

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*Above is an excerpt of a letter from a County Road Engineer in a Northwestern State. Name on request.

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except where the subgrade soils are the free draining granular type, or where desert conditions prevail. In the absence of gutters and inlets, the paved areas are raised about 2½ in. and the raised edges filleted to hasten surface removal.

Use of porous filled trenches adjacent to pavements has been abandoned by CAA engineers as a means of surface drainage because their experience has shown that such drains silt up. And rapid infiltration has tended to suck fines away and undercut pavement edges.

Porous backfilled pipe drains at Rentschler Field, Hartford, built by Pratt & Whitney Aircraft Division, were backfilled for the last 6 in. by open graded 2½-in. max. crushed stone coated with emulsified asphalt. This was done in an attempt to assure a permanent degree of surface infiltration.

The CAA philosophy is to keep the surface collection and subsurface drainage functions separate. This agency gives careful attention to proper spotting of catch basins, good grading contours, and ponding, as well as the determination of pipe sizes and gradients.

Thick Runway Slab Internally Vibrated

A 12-14-in.-thick concrete runway, designed theoretically for an 85,000 lb. wheel load, but actually capable of carrying over twice that concentration, was pushed toward completion at Lindbergh Field, San Diego, late in 1944. The new runway will be 8,500 ft. by 200 ft. with 225-ft. asphaltic paved storm-water catchment areas and 75-ft. parallel taxiways immediately adjacent.

The concrete slab is of uniform 12-in. thickness excepting at one end where it is increased to 14 in. to accommodate warm-up stresses.

Concrete was placed in 25-ft. strips, using two 34-E single-drum pavers on one side of the lane, skips outward from each other for batching from two directions, and a third 34-E on the other side. Interest centered in special effort made to secure uniform concrete from top to bottom of the unusually deep slab.

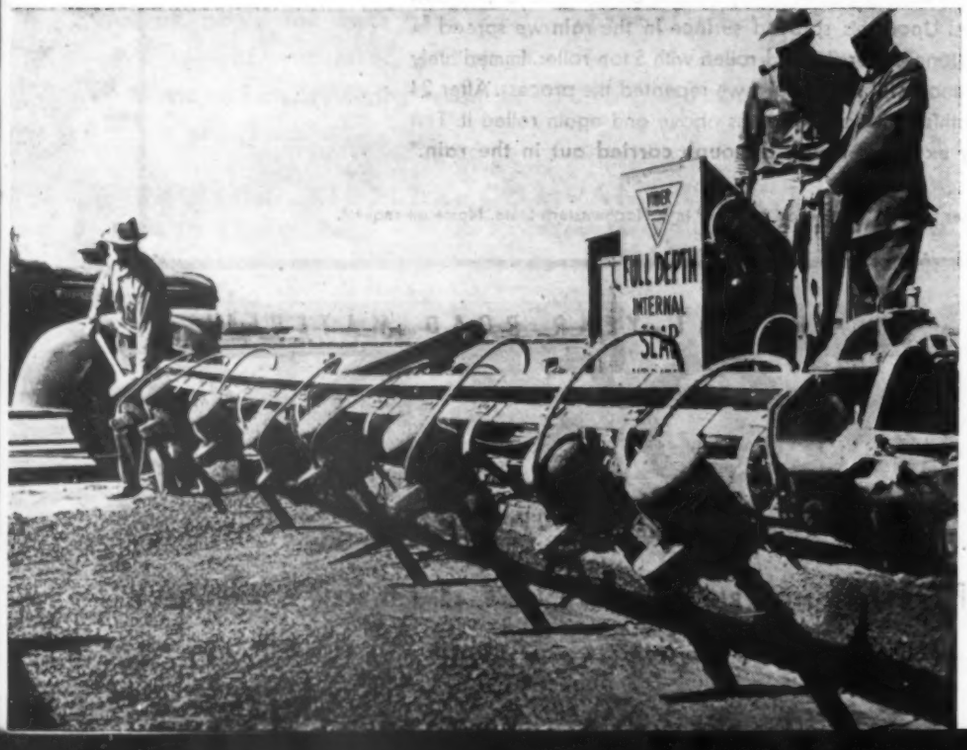
An exceptionally rigid quality control routine was set up, assigned to an outside laboratory (Smith-Emery Co.). Mix design is based on 5½ sacks per yard. Slumps under 2 in. were attained consistently, the W/C ratio averaging about one to two by weight.

Vibration was supplied by a full-depth vibrating machine equipped with 8 "stingers" or vibrating elements spaced 35 to 40 in. apart and 6 in. from side forms.

Concreting progressed at a rate varying from 700 to over 2,000 cu. yd. per 10-hr. day, averaging about 1,500 cu. yd. for the 103,500 cu. yd. of paving.

An exceptionally strong base was provided by obtaining subsoil compaction 10 to 20% above the 90% AASHO standard specified (T99-38 designation) and topping with a layer of imported select material plus crusher-run sand-gravel layer, varying up to 24 in. in combined thickness as required to utilize available materials.

The project was sponsored jointly by Consolidated Vultee Aircraft Corp. and the Navy. T. W. Van Derveer, Convair plant engineer, and John F. L. Bate, engineer in charge of construction represent the company. The Navy represented by Capt. A. K. Fogg, public works officer, 11th Naval District and Lt. Commander R. D. Thorson, on design and construction, respectively. The consulting firm of Bowen, Rowe & Rule assisted in design and served as special construction advisers. Casson & Ball of Berkeley, Calif., were the contractors.



(*Continued from page* 81)

of the assessed property value within the airport area, and condemn property.

Total bond issues are restricted to 2½%. Issues exceeding 1% require separate referendums.

The authority is governed by five or more commissioners, appointed by the mayor and the county judge.

Agricultural land not needed for airport purposes may be disconnected from the area and exempt from taxation.

Proposed airports must be sanctioned by the state aeronautics commission.

The disconnection section and a municipal sponsorship provision of a 1943 airport authority act caused its nullification by the Supreme Court.

Sponsors say the flaws were corrected in the new act.

New Jersey Gets New Parkway Law

Of interest to many other states is New Jersey's new parkway and freeway law, statute A-59, which, according to Highway Commissioner Spencer Miller, Jr., will greatly aid the state's postwar program. Culminating ten years of legislative battling, this law gives the highway department five broad authorizations:

1. To build occasional parking areas, landscape areas and other necessary non-commercial facilities in connection with parkways (highways on which commercial traffic is restricted).
2. To acquire, in connection with freeways, an average 300-ft. r/w; or more width when needed for grade separations and connecting roadways.
3. To establish "controlled access" in accordance with PRA approved practice, as a safety measure.
4. To restrict parkways to passenger vehicles (Utility Commission must approve if franchise bus lines diverted).
5. To restrict commercial enterprise in or on property acquired for freeways or parkways.

The legislature will pass on both route designations and types of construction and will vote on the appropriations.

To China - By Land

The Ledo Road is only one of many tasks of the U. S. Army Service Forces and the Engineers

By BRIG. GENERAL T. F. FARRELL
Corps of Engineers Construction Service, SOS, India-Burma Theatre

THE primary mission of the United States Army in India and Burma is support of the China Theatre.

Aid to China has required the establishment, maintenance, operation and security of a land line of communications, and security of the existing air route to China.

That part of this overall responsibility falling to the SOS in India and Burma includes: (1) construction and maintenance of the Ledo Road to the Burma-China border at Wanting; (2) construction, maintenance, and operation of pipeline to Kunming; (3) construction, maintenance, and operation of signal wire communication to Kunming; (4) operation of through motor transport to Kunming; and (5) security of roads and pipeline to the Burma-China border.

The responsibility of the China Theatre includes: (1) construction and maintenance of the Burma Road in China; (2) designating the cargo to be delivered to China, and allocating such cargo to users in China; and (3) security of road, pipeline, and wire line in China.

The land and air communication routes to China begin with the ports of India. Calcutta is the main supply port, though Bombay is used for troops, and Karachi is our reserve and secondary port. The tonnage cost of shipping is 1.9 tons by air, 2.25 tons by road, via the longest overland communication line in any theatre of war. We see to it that the ton arriving at the "end of the line" is in new condition, properly packaged, and carefully handled; for that end of the line ton is precious.

Leaving the dock areas at Calcutta, supplies move north through Bengal toward Assam by either river or rail transport. Two commercial lines on the Brahmaputra are directed by the Calcutta Panel Committee (on which are both American and British army representatives); but river tonnage fluctuates widely. There usually is either too much or too little water in the Brahmaputra, there are delays in unloading, and barges are often tied up on shoals. The Brahmaputra has needed some engineers.

A secondary barge line on the Ganges and Brahmaputra runs from Goalundo to Dacca transporting 4,000,000 gallons of petroleum products to the airfields in eastern Bengal province.

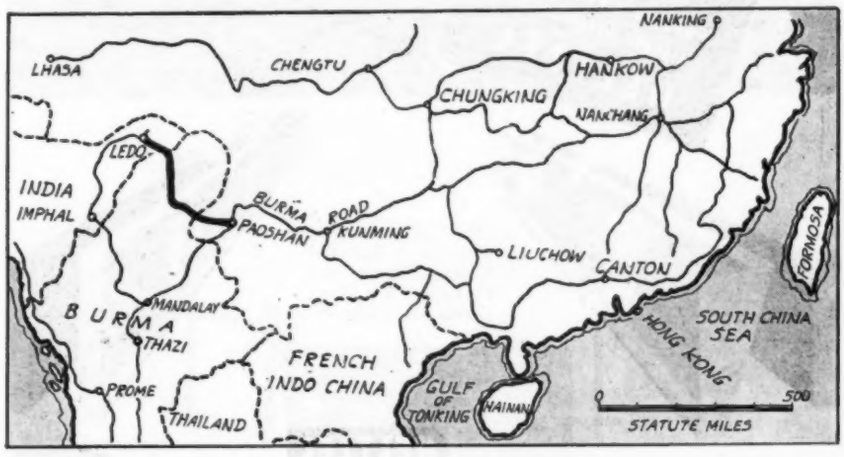
Rail Transport Better

The American Military Railway Service operates meter gauge lines generally east of the Brahmaputra to Ledo—all other lines in India operating under the Indian Railway Board. The Service took over in March, 1944.

LOC rail operation to Assam uses three systems: (1) broad gauge lines from Calcutta to Santahar and Parbatipur; (2) the Military Railway Service meter gauge line from Katihar through Parbatipur to Northeast Assam; and (3) the Bengal and Assam meter gauge line from Santahar across the Tistamukh Ferry and up the Hill Section into NE Assam.

The latter two meter-gauge systems are now the bottleneck on rail transport; formerly it was the broad gauge line from Calcutta north.

Deep in north-central Burma, we now have another railroad line runing between Moguang and Myitkyina, operated at its northern end by Advance Section 3, SOS, and at its southern end by the British. This short stretch of railroad is a makeshift temporary operation using a variety of motor power ranging from captured Japanese engines to jeeps equipped for running on rails. There is no signal system—just block operation. The mortality rate on jeeps is high; I have seen as many as eight jeep "locomotives" crushed like accordions along its right of way.



At Ledo, the Road Begins

The Ledo Road is our proof that the job hasn't yet been found which can lick American Engineers and American construction equipment.

Plans for the Ledo Road project were submitted to General Stilwell on Nov. 5, 1942. On Dec. 10, 1942, the road became officially an American project, with the advance contingent of American troops already at work at Mile 0.00.

At the end of March, 1943, the lead bulldozer was at Mile 47.3; but the trace it had made was not even passable for jeeps. Native porters were carrying the lead dozer's fuel to it. As the first monsoon closed in around the too-few men with their too-little equipment, the "road" almost literally disappeared beneath them. Earth shelves became saturated with rain and collapsed, sometimes burying equipment in the heavy slides. Near the end of that first monsoon season in Oct., 1943, 80% of the company of engineers at the road point had malaria. Yet General Stilwell was depending on the road to supply his winter campaign against the Japs in the Hukawng Valley.

General Stilwell got his road. On the morning of Dec. 27, 1943, the lead Engineer bulldozer broke into Shingbwiyang at the head of an Engineer regiment which cut 54 miles of dozer trace in 57 days through some of the world's most difficult terrain. The 4000-ft. Patkai mountain range was crossed by a convoy of 55 trucks carrying Chinese combat troops and equipment. As Stilwell's offensive moved into high gear, Brig. General Lewis Pick, in charge of the Ledo road's construction, diverted a large percentage of his Engineers to do combat engineering for both Stilwell's Chinese troops and Brigadier General Frank Merrill's Marauders. The Engineers armored bulldozers cut combat trace through the jungle in ad-

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vance of the infantry so that tanks, artillery, and supply trucks could move to the battle sites. This combat engineering reached its climax in May 1944 when two Engineer battalions were flown from the road into Myitkyina to relieve the Marauders in helping take that city in a 74-day siege.

129 Miles—Then Rain

Meantime, construction of the Ledo had reached Mile 129.20 at Warazup before the 1944 monsoon began. We recorded 175 in. of rain in the north Burma hills during that season; but we held our road. Except for occasional road blocks, truck convoys and heavy equipment moved forward during the rains to advance depots from where they could begin new construction at the rainy season's end. In 40 days and nights, a causeway 1.8 miles long and requiring a million board feet of lumber, was built by the Engineers to lift the road above one flooded section of the Hukawng Valley. When the 1944 monsoon ended, we were ready for the last jump—the cutting of a trafficable route to connect with the Burma Road at Wanting, while the combat trace continued to follow the troops pushing the Japs southward through Bhamo and beyond.

In round figures, General Pick's Engineers have moved to date a total of 13,500,000 cu. yd. of earth in grading the Ledo; and have hauled from stream beds a total of 1,383,000 cu. yd. of gravel for preliminary surfacing. This is enough earth to build a yard-wide and ten-foot-high wall in a straight line from New York City to San Francisco. It is enough gravel to fill a string of railroad cars 470 miles long.

Present and Future of Ledo Road

At present, therefore, there is a two-track, all-weather road completed from Ledo into the base at Myitkyina, and the road is being extended from Myitkyina to Wanting on the Burma Road. Traffic is moving down this route over combat trace and existing dry-weather road to a point 170 miles southeast of Myitkyina.

On the other wing of the inverted "A", traffic is moving down the Burma Road from Kunming to Lungling toward Wanting, with construction of a one-track road keeping pace with the tactical advance.

Cutting across to join the two roads, dry-weather jeep traffic has now been established between Myitkyina and Tengchung on the Lungling-Tengchung-Myitkyina short-cut built by Chinese construction forces.

Our target dates for future work call for improvement of the road from

Myitkyina to Wanting to all-weather standards by May 15, 1945. On the Burma Road we expect to improve the Kunming to Wanting Section to all-weather standards by July 1, 1945.

The estimated capacity of this road system may be of considerable interest. The maximum hauled in any one month over the old Burma Road prior to its loss to the Japanese was 18,000 tons. Air transport to China has now climbed above 40,000 tons a month, though there are still some items of Army equipment which cannot be transported by air. With considerable engineering improvement to the road coupled with American management of the transport system, reasonable estimate of the capacity of the reopened Burma Road is 60,000 tons per month.

60,000 Tons a Month

The engineering required for reaching such a figure as 60,000 tons a month over the Burma Road will involve bridge strengthening, reduction of grades from the present 17% to 10% or less, the widening of narrow shoulders, and the elimination of the sharpest curves.

▼

A.S.T.M. Cancels Annual Meeting—The American Society for Testing Materials has cancelled its 5-day regular annual meeting, scheduled for Buffalo, N. Y., June 18-22, and instead plans for a business session to be held the latter part of June in New York City. This will permit action on the formal standards to be consummated and society business to be conducted.

▼

3 More States Act on Diversion—At the sessions of 28 state legislatures, which had adjourned prior to April 22, 17 gave some attention to constitutional amendments to prohibit diversion of highway user revenue. However, only three states enacted such legislation: Tennessee, Indiana and Maryland. The Tennessee measure must be passed by the next legislature before it can be submitted to the voters.

▼

(*Continued from page* 79)

Since federal aid is new to the smaller subdivisions of the state, plans for aiding the farm-to-market roads for the most part are not so far advanced as those of the state. They should be and they can be—especially if the voices of the highway users are heard in the land. Under our democratic government, there's nothing like public opinion to get things started. We may be certain that the American farmer, with relief in sight, will not remain unheard.

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How Arc Welding Saved Old Bridge

From a paper submitted in the Industrial Progress Award Program sponsored by The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

By C. M. NEELD
President, Neeld Construction Co., Pittsburgh, Pa.

THE maintenance and repair of steel bridges by arc welding is not new. However, in few cases has the process been applied to the extent and with the success of that shown on a project at Steubenville, Ohio. At a time when steel and other materials were already faced with serious shortages caused by war, a 35-year-old suspension bridge over the Ohio River there was judged by inspection to be unsafe and unsatisfactory as a mortgage bond investment.

Inspection engineers demanded a complete new super-structure at a direct cost of $700,000 which would involve also an 18-month closing of this toll bridge. This presented a direct toll loss of $225,000 and possible continuing losses due to traffic diversion.

At a cost slightly over $300,000, the bridge was renewed and traffic (including war traffic vital in the extreme) not only maintained that year without interruption, but revenue increased during reconstruction, so that the toll income almost paid the reconstruction bill. The dead weight of the structure was reduced, the roadway widened, and the carrying capacity increased from a posted "12-ton gross" to modern H-20 rating, suitable for 20-ton trucks and the heaviest modern army equipment.

This bridge (Fig. 1) has a center span of 700 ft. suspended side spans of 324 ft., 276 ft., and 496 ft. of steel truss and girder approach viaduct on the Ohio side; total structural strength, 1,796 ft.

Steel towers on masonry piers in the river carry two 7½-in. cables, cradled from 33-ft. spacing at the top of towers, to 25-ft. spacing at anchorages. Each cable consists of 1,500 bridge wires divided into 7 strands. A stiffening truss of light steel construction was incorporated in the original bridge as reinforcement in 1924 after failure from buckling.

The original 20-ft. roadway and sidewalk were of timber and were carried by steel stringers and timber joists.

Welding Equipment Cost Outlay

The investment in welding and allied equipment here, in addition to regular field equipment, was an almost insignificant sum. Welding machines were rented and paid for themselves as they went. About $8,000 would have purchased them outright, but they were needed for the regular field work anyway. A tractor costing $2,000, with a $1,000 crane attached, constituted the handling equipment for all steel, including floor manufacture. Two hauling trailers were made (with the welder) at less than $1,000. With trucks already on hand, and special erection equipment which had nothing to do with shop investment, the entire investment in comparison with the $250,000 shop of the riveting method, was less than $5,000 for the arc welding process.

The writer, in addition to supervising the manufacture and construction, designed the structure, worked out all of the details, as far as detailing was necessary, ordered the material, and supervised the laying out and cutting of it without assistance other than the actual work of foreman and men. Such a thing would have been unthinkable except for welding.

More Deterioration Than Anticipated

Preliminary work disclosed more deterioration than was anticipated by the original inspection, and replacement of defective material by arc welding as reconstruction progressed, presented an economical and ingenious solution to these previously unknown circumstances. Inspection of the structure indicated that it did not measure up to the requirements for a modern H-20 bridge. As construction progressed, further work was necessary on the timber-pile-supported cable bent piers within range of river level. A 52 x 59-ft. elliptical ring of 20-ft. sheet piling was driven around the base of this pier, enclosing a 2-ft. concrete mat. This piling was welded to provide additional resistance and stability to the anchorage. The cable bent itself was found deteriorated and was reinforced by plates welded to the original material.

Masonry piers for main towers were not altered, but the towers were reinforced. Each leg of the original tower consisted of four columns, forming longitudinal and transverse A-frames. The transverse A-frames of each leg were reinforced with solid ⅝ in. plates, stiffened with welded angles and welded into place.

It was necessary to correct the chamber of the suspended spans before work was started. A proper chamber curve was run across the bridge with points marked on the 1½ in. round bar suspenders. The bar suspenders were then cut one at a time, shortened, and spliced to correct length by arc welding.

The original stiffening trusses were replaced with new Warren-type trusses of completely arc welded construction, having members of rolled sections. The new top chords are 14 in. and bottom chords 12-in. flange beams with webs vertical. The web members are 10-in. beams also placed in a vertical plane.

As the welded bottom chords were free from rivets and splice material, their lower flanges formed ideal rails for a movable platform which the contractor suspended from them to aid in under-floor work. A new top lateral system of 6-in. H-beams was installed. In view of the great stiffness and continuity of the arc welded floor, a bottom lateral system was not required.

New Floor from Sheet Piles

The original timber floor with steel stringers was removed and replaced with welded-type floor sections con-

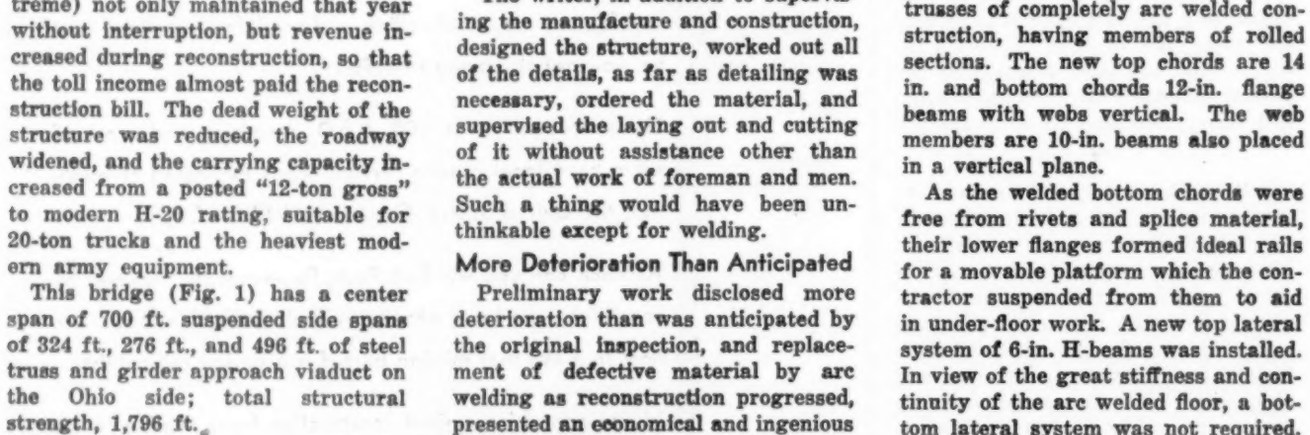


Fig. 1—Steubenville suspension bridge, reconstructed by arc welding. Peculiar suspension cable system at Ohio end presented one of problems of reconstruction

sisting of sheet piles laid flat with the web uppermost and welded together. The troughs were filled with concrete and the entire floor section then paved with a bituminous surface (Fig. 2).

The floor beams were reinforced by welding a 6-in. H-beam to the top flange and a 14-in. I-beam to the bottom flange. By utilizing part of the continuous floor and guard rail as part of the truss chord, the center of gravity of the structure was moved toward the floor, thus reducing the unit stresses on the other chord and increasing the over-all capacity of each span.

Welding permitted use of a lateral system comprising 6 x 6 H-beams and of sub-floor beams comprising 8 x 8 H's, to erect the construction track for the erection of the new trusses around the old. This material was used in long lengths. The 8 x 8's were used crosswise to carry the track and were made to clear all obstructions by welding a 3 x 3 angle under them to raise them over bolt heads, etc., in the old structure. Then the 6 x 6 H's were placed longitudinally for the track of the erection trucks. These were electric arc welded to the cross beams and also the ends electric arc welded. Electric arc welded expansion joints were included in the design. After the completion of truss erection, these were easily cut loose with a torch, and cut in two on bevels and simply swung around into practically the same position as for the top lateral system. The sub-floor beams were removed to be used again later without waste in the assembling of the welded floor.

Other Welding Details

In other places, also, electric arc welding was used to a large extent. For instance, it became necessary to cut through the top portion of the floor beams in order to permit the floor to be raised without disturbing the location of the cables and, after raising, to weld the top portion of the floor beam back around and above the cable. This was a simple operation and inexpensive by arc welding but it would have been quite difficult and expensive by riveting methods. The take-offs were welded to the new anchor bars and were so attached to the pins holding the original anchorage bars that advantage of the welding heat to pick up the strain between the new and the old was fully utilized by applying the welding in the proper way and allowing part of it to cool and be finished later. After the raising, a series of ½-in. plates were welded to the top of the floor beams at the hanger point, these plates having had a hole cut in them to match

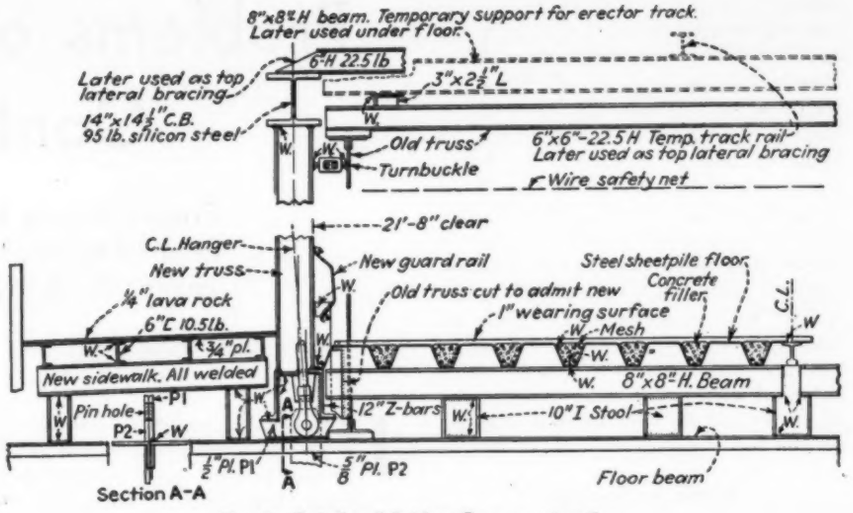


Fig. 2—Details of bridge floor construction

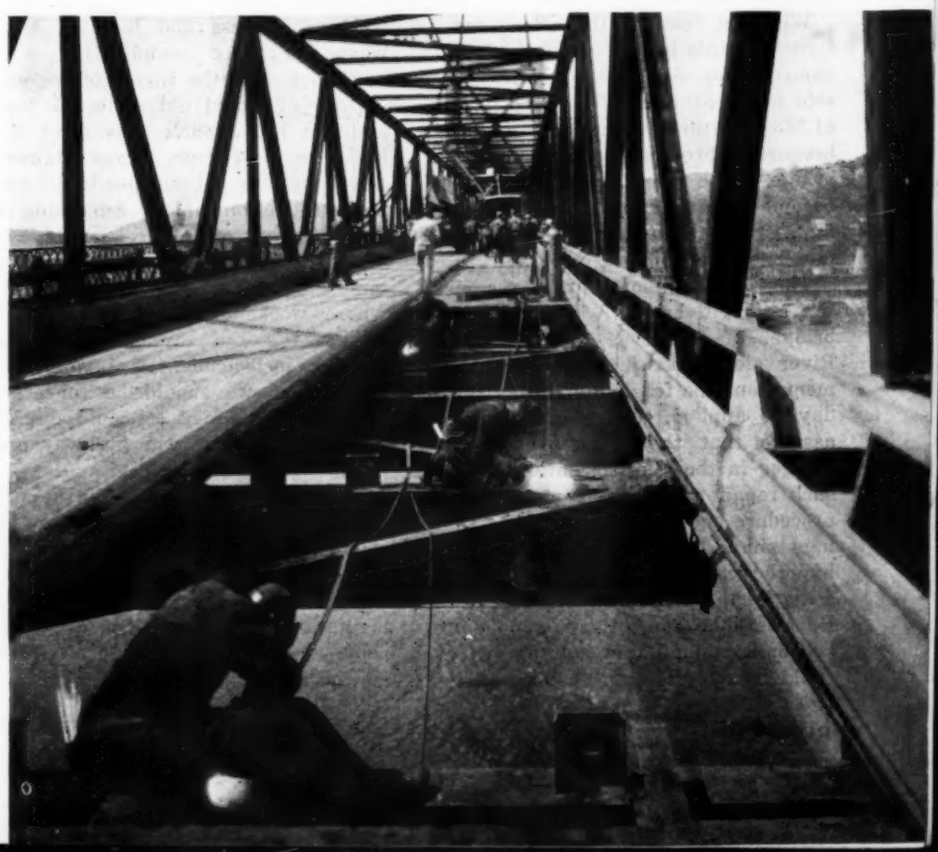
the hanger pin. The hole was cut in the field by a mechanical circle burner. In order to bring the entire structure up to the increased loading, it was necessary that the floor beam hanger plate be made thicker and additional strength added to the connection. Means of attaching the new stiffening trusses to the floor beams had to be provided.

Lower Chord Work Tricky

The next operation was the placing of the lower chord members which consisted of two 12⅞-in. car sill Z-bars. One was brought in from each side of the hangers, it being necessary to maintain hangers at all times. The necessary notches were cut in at every floor beam hanger, lapped and continuous stitched. These were welded underneath to the plates fashioned to the floor beam as previously described.

Diagonal and hanger members were erected from the construction tracks on top of the bridge, by truck cranes built on the job (again with help of welding). The members were welded to the lower chords, joined together at the top, and held to the old stiffening trusses by means of a turn-buckle with stubs set for sufficient adjustment in either direction. They were

Fig. 3—View of bridge reconstruction job with arc welding in progress. Note open traffic lane (left)



welded one end to the old truss and one end to the new truss members. In addition, the wide flange beam top chords were set and welded. Thus the whole structure was set up without the use of a single bolt or rivet or any holes of any kind, except the turnbuckle at 30-ft. centers on top chord only. The diagonals, etc., were simply laid out and cut by torch to the proper angles on the job. This made it possible to erect the entire stiffening trusses without welding the splices of the top chord, or in other words, to get the entire structure ready and balanced without affecting the stresses of traffic before welding was started on the top chords.

Notes on Savings

In detail, the savings in steel alone due to welding was about 300 tons. In addition, practically all shop fabrication, extra freight, and pre-fabrication costs of overhead were saved. Alternative floor construction that would have received serious consideration in any other design was a reinforced 8-in. concrete slab, with 1-in. wearing surfaces, weighing about 118 lb. per cu. ft. The welded floor weighed 48 lbs. per sq. ft. In this particular job, the writer calls special attention to the fact that all of the material was shipped direct from the rolling mill or stock yards to the job without any shop fabrication whatever, except some few parts needing machine work. Thus, savings were made at the start in freight loading the unloading charges, drafting, shop costs, overhead, profits, income taxes, etc., as would by pyramided by each organization that handled materials.

Within a few months after reconstruction, this bridge, which had previously been declared obsolete, was sold to the State of West Virginia for $1,365,000, this value being reduced because of proximity of a competitive bridge in the vicinity which will soon become free. It is apparent from these figures that the savings mentioned are not long range.

The savings above, of course, are for a single bridge. There are 15 bridges of this type over the Ohio River alone on which similar treatment would be feasible and may some day be applied. It is reasonable to assume that there are over 20,000 bridges in the United States needing such repair and reinforcement as the procedure shown permits. These savings may be considered somewhat hypothetical, yet it is believed that if a national emergency required that this work be done, there is no more economical nor rapid solution which could be offered than that described.

Problems of the Postwar Contractor

From a timely talk given at the recent 1945 Highway Short Course, Texas A & M College, Bryan

By J. RUTLEDGE HILL
Gifford-Hill & Co., Inc., Dallas, Texas

HIGHWAY engineers naturally are concerned with many departmental and engineering problems these days. But they should also be mindful of the fact that the contractor, too, has his problems. In the final analysis the contractor's problems nearly all are of real concern to the highway department because they affect bid prices and conduct of the work.

Problem 1: Labor

The efficiency of our labor today is sometimes pitiful. As an example, I can cite the instance, observed the other day, of a job where concrete was being carried from a mixer in the usual rubber-tired barrows, with three men in front of the barrows helping pull it. In the old days, given a reasonably good path, a wheelbarrow was considered a strictly one-man vehicle.

The labor supply will improve, of course, but not necessarily the efficiency. One reason for concern here in Texas as elsewhere is the spread of unions whose idea is to see that workers do less and less for their wages. Further complicating work performance is the threat of increasing jurisdictional difficulties. I foresee that this trouble may some day begin to be felt in Texas highway work and may spread also into material production unless something is done about it.

Contractors don't object to good unions or to paying high hourly wages where workers do an honest day's work. It's the threat of featherbedding, inefficiency, job-stoppage and waste that we should be concerned about. Such practices could quickly hamstring our postwar highway program.

One ray of hope here is in the attitude of returning veterans. Many of them, we believe, will not take readily to abuses of the union idea. They will want to make good on their new civilian opportunities. In any case contract prices must go up as unionization comes along.

Problem 2: Equipment

Our equipment now is pretty well run down. Much of it is obsolete. Repair parts when obtainable aren't up to standard. We all face the problem of re-equipping ourselves with the best modern equipment obtainable in order to compete. The question is, will this equipment be available, when and for how much? It is vital that we obtain new and modern equipment very quickly, or we cannot do your work for as cheap a price as we would like.

Prob. 3: Depreciation Allowance

The question of depreciation on equipment is a vital one. With the very high tax rates now in effect and which will doubtless remain in effect for some years, it will be hard to get our money back out of equipment. Used equipment in ordinary times, unless it is at work on the job, is not an asset, but a liability. There is much talk of what is known as accelerated depreciation or more rapid depreciation of equipment to carry us over this trouble. It is most urgent that the Bureau of Internal Revenue recognize this condition and allow proper depreciation schedules to enable the contractor to keep himself equipped with modern equipment.

It is still more important for returning veterans or the new contractor getting into business during the postwar years. Under the present setup of taxes and depreciation schedules a new contractor in the field could not ever keep enough money out of his earnings to pay for his equipment.

Problem 4: The Engineer

Most engineers know their jobs and are well qualified, but, and I hesitate to say it, sometimes the project or resident engineer rates as a problem. I've had engineers on my contracts who didn't know what they wanted and wouldn't know what to do about it if they had what they wanted from us. The worst fellow is the one who is afraid to make a decision.

But it isn't just knowledge that the engineer needs. He should be a sales-

(*Continued on page* 106)

Basich Bros., contractors, sealing with 30-ft. spreader bar

165 Miles of Igloo Access Roads

JUST how many thousands of tons of war materials each week are shipped in or out of the Navajo Ordnance Depot in Arizona is a military secret, but it is no secret that every ton must be deployed from the Depot's unloading docks to underground "igloos" or above-ground magazines. These storages dot a reservation of 32,000 acres and to reach them a network of 165 miles of roads has been required. Building these roads in double-rush time, using the best available materials in the absence of plentiful local sand, gravel or stone, was the problem thrown at the U. S. Engineers back in 1942 when the project was initiated.

The depot reservation lies in a hilly, lightly forested area at about 7,300 ft. elevation and in a belt which receives an annual average of 60.7 in. (U. S. Records) of snow. The soil is decomposed volcanic cinders, Public Roads Administration Soil group A-5 predominating. In 1942 when the initial contract was let for concrete igloos, the existing fire trails quickly proved inadequate, the fine volcanic soil churning up dense clouds of dust or turning into soft mud. As the first step a contract was let to grade and build up roads with the natural soil and place a 10-in. blanket of cinders, a material which lies hundreds of feet deep in the form of volcanic hills throughout the locality. Cinders were spread and rolled in 5-in. lifts. The Arizona highway department had used these cinders in stabilized roads, with fair success.

Limestone Added, but Oil Unobtainable

Also in 1942 several small deposits of limestone were located on the area. In the initial contract and also in a supplementary contract involving roads and igloo paving, a 5-in. layer of rolled stone was added to the roads over a portion of the depot by the season's end. The specifications called for an SC-1 oil treatment and chats, but oil suddenly became unobtainable and as a result a considerable mileage of stone roads went through the 1942-3 winter without any protective cover. Under the churning of truck wheels the limestone dust created a very muddy condition and serious deterioration took place.

The depot was activated early in 1943 and ordnance hauling along snow cleared lanes added to the damage.

Bituminous Topping Became Urgent

Ordnance officials then agreed to a bituminous topping, a need made more evident by the summer dust. In autumn, 1943, Basich Bros. of Los Angeles were awarded a contract involving placement of 3 in. of cinder leveling on roadway and shoulders and a 2-in. compacted layer of MC-5 hot-mix. The first step was to shape up the rutted limestone roads with blades and seal roadway and shoulders with MC-1. Placement of leveling cinders proved to be troublesome, due to the lack of fines and hence of cohesiveness in the cinders when spread out thin over a compacted base. Satisfactory compaction often required 30 to 50 or a prohibitive number of passes of the sheepsfoot roller.

A usable clay eventually located in a small deposit was mixed with the cinders experimentally, resulting in better compaction on a portion of the roads. Clay was added in proportions designed to make the blended materials meet the 40, 80 and 200 sieve specifications for good grading.

Meanwhile, a start was made late in '43 on hot-mix placement, using a sin-

Several miles of concrete pavement in the administrative area were given a hot-mix cover in 1944. Two smooth rollers worked with the mechanical spreader, this one being a 14-20 ton unit

Brooming loose volcanic cinders from pavement back on to shoulders of arterial roads preparatory to sealing shoulders

Note the two driers laid out to work in tandem when drying cinders. At one of two large pits from which 70,000 tons of volcanic cinders was taken for hot-mix in 1944. The Plant here included a 4,000-lb. pug mill, three aggregate bins, vibrating screens. Imported sand, added to the hot-mix in 1944 work, was stockpiled at the cinder pits

gle drier at each of two plants. The one drier was unable to reduce moisture in the cinders below 8 or 10%, which was considered too high. Work shut down in December, before there was time to complete sealing, and by April, after a winter which brought 94 inches of snow, a considerable yardage of the roads thus surfaced had failed. Failure was determined to be due not only to excess moisture in the cinders, but also to use of a too volatile kerosene cutback, lack of time to seal, and drainage problems.

50% Stone Added, Two Driers on Cinders

During the 1944 season, under the existing contract and a supplementary agreement, the contractor has done extensive repairs and completed black topping of roads now totaling about 95 miles. Profiting by the adverse experience with 100% cinders and by tests on various blends, a specification of 50% cinders and 50% crushed stone (20-mile haul) was adopted, calling also for a 120-150 pen. asphalt and use of two cinder driers in tandem. This mix has stood up in a generally satisfactory manner.

On several miles of arterials, the cinder leveling had shown such an unsatisfactory condition that it was removed down to the 1942 limestone. This was accomplished with scrapers and vertical front-lift loaders, seal was applied, and hot-mix placed directly on the stone. The hot-mix layer was thickened in excess of 2 in. wherever bearing value tests taken every 400 ft. showed a slight subgrade deficiency that could thus be compensated for. On igloo fringe roads the hot-mix was placed over the cinder leveling where tests showed satisfactory bearing values.

1,200,000 Sq. Yd. Sealing

All 1944 work has been sealed with about 0.5 gal. of emulsified asphalt and sanded, the seal area covered being 1,200,000 sq. yd.

The completed system comprises 11-ft. cindered igloo access roads, 18-ft. bituminous-surfaced fringe roads, and 22-ft. bituminous-surfaced arterial roads, all of the latter having 4-ft. treated shoulders.

The depot layout includes 8 concrete rail loading docks and 8 dunnage buildings including 22 bituminous-surfaced loading aprons about 45 x 500 ft. in area.

The 1944 program, all in all, covered bituminous surfacing for 24 miles of arterials, 35 miles of fringe roads, 50,000 sq. yd. of dock aprons and 76,000 sq. ft. of aprons in front of igloos. About one-fourth of the igloo aprons are concrete. About 7 miles of concrete streets through the administrative area were given a hot-mix wearing course late in 1944.

Further underscoring the size of the project, 1944 material tonnage included 70,000 tons of imported natural sand for plant mix, 70,000 tons volcanic cinders for plant mix, producing 90,000 tons of mix (see explanation), 2,700 tons emulsified asphalt for seal, 12,000 tons sand cover.

Sand Fines Blown Out

The foregoing discrepancy between 90,000 tons of hot-mix and 140,000 tons of material is explained by the fact that the second drier, which took the combined aggregate from about 8% down to 2% specified moisture, blew great quantities of fines up the stack. The use of collectors to reclaim their fines wasn't feasible due to the location of the plants and lack of necessary utilities. Sufficient fines were carried over to the mixer to produce proper gradation in the final mix.

The road system as completed today under four contracts represents about 5 million of the depot's $30,000,000 approximate construction cost.

The contractor, Basich Bros., under Superintends Jess Smith and George Kovick, kept the following outfit busy this past year:

3 bituminous pavers
40 to 100 dump trucks
6 flat racks
8 water trucks
12 motor graders
6 tractor-scraper units
8 tandem rollers (8 to 20 tons)
2 hot-mix plants (2 driers)
3 crushing plants, 125 to 150 ton
5 oil distributors
5 oil haul trucks, 1,800 to 6,000 gal.
1 retort
12 pick-up trucks
2 portable electric generators
2 cinder pit shovels, 1½-1¾-yd.
1 shovel, ¾ yd.
2 power brooms
2 sand spreader boxes
2 winch trucks
1 tractor with vertical-lift loader
2 large buses for workers
2 grease trucks

(*Continued on page* 108)

Scene during 1943 hot-mix resurfacing. From 40 to 100 dump trucks were engaged during 1943 and 1944

One of the arterial roads at Navajo Ordnance Depot after hot-mix and seal had been placed, October, 1944

Equipment Maintenance

HARD FACE IT!

New Life for Road Building Equipment

Old stuff to you? So you may feel. But are you making the most of the hard-facing technique? Many equipment users are not. Watch for additional articles on the tricks and details of hard-facing

By M. L. EDER, Manager
Technical Advisory Service Staff
Coast Metals, Inc.
Canton, Ohio

THE maintenance and repair of worn machinery parts by hard-facing with weld rod is not a new process. Yet its continual, ever-expanding application to different fields keeps it among the "pioneer" methods. Owners of earth-moving and construction equipment have become leaders in the use of hard-facing.

Hard-facing is a process by which a hard wear-resistant alloy is deposited by welding to the surfaces of worn equipment parts. This not only restores a worn surface, but often makes it many times more wear-resistant than the new part.

More than ever during this emergency, emphasis has been on salvage and maintenance, rather than on replacement. Not only have restrictions on the manufacture of new equipment posed serious problems, but restricted manufacture of replacement parts has curtailed ordinary procedures. Even if replacement parts are available, there is often a serious time gap due to transportation difficulties.

Keeps Shovels Digging

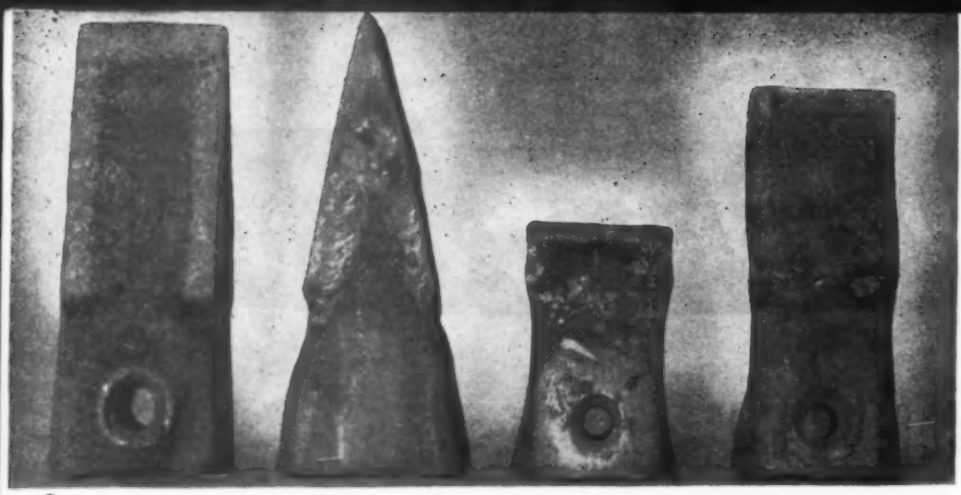
One example will suffice to show how serious this problem can become. An average power shovel shows devastating wear at the bucket lip and teeth in a very short time. Since it is difficult to maintain a stock of replacement parts, the wearing away of such teeth could halt the service of this equipment for days. Labor on the job would then be idle, with the time lost impossible to make up. Peak output would be out of the question, and an outright loss might be incurred.

Modern hard-facing is an efficient answer to this problem. With the proper hard-facing weld rods and the simple applying technique, the teeth can be refinished to original dimensions, often right in the field, in a surprisingly short time.

The obvious advantages to refinishing by hard-facing are many, and are closely related to one another. We find, for example, that equipment will last longer. Service and field reports show that such hard-faced parts will outwear original parts from three to six times. Because of the less frequent requirements for repairs and replacements, it follows that there will be fewer stoppages, and hence a saving in time and cost of labor. Since hard-facing overlays provide an extremely hard surface, it is feasible to use a plain, medium carbon or low alloy steel base. In this way, critical, expensive metals can be conserved. When the hard-faced overlay finally wears away, a second and subsequent hard-facing coating can be applied to keep the part in perpetually serviceable condition. Worn equipment causes sluggish operation, poor control and decreased output. The hard-facing of worn equipment is, in effect, a power saving technique. Adding up all of these advantages, we find that they solve many problems of the road and street building contractor in the maintenance of his equipment.

Hard-facing metals are patented alloys whose composition is based on exhaustive laboratory and field tests. The alloys are formed into weld rods 12-in. long with 3/16, ¼ or 5/16-in.

(See photo above). A 14% manganese steel dipper tooth removed for hard-facing a second time, after long service. Notice that the hard-facing beads are still in good condition, except on the point. Another hard-facing will restore this part to satisfactory service



Old bucket teeth need not be discarded—a wasteful custom with many operators. Typical restoration of such teeth. From left to right: (1) Ready for service—bucket tooth hard-faced along sides and at point, after new tip has been welded on worn tooth. Note hard-facing protection around hole. (2) The same tooth, side view. (3) Typical worn tooth. (4) The same tooth after a new tip has been welded on

diameters. Rods are applied to worn parts by electric arc or acetylene torch welding. Any welder can do the job by following a few simple rules. In earth moving equipment, the recommended types are more frequently electric-arc welded. These alloys are hard, tough and non-magnetic, showing outstanding resistance to abrasion. Single layer Rockwell hardness for a commonly used alloy runs 52-57; multiple layers run 53-59. This alloy will withstand mechanical wear, abrasion, impact, shock and heat.

Skilled Welders a Problem

The problem may arise as to competent help in the application of hard-facing. Since welders are scarce, and the individual contractor may not have a sufficient need for a full-time welder, many methods have been worked out to overcome this. Probably the best suggestion has been that the foreman or some other competent employee learn welding, so that when the need arises, this individual can be called upon for the purpose. There are but a few simple rules to follow. Standard welding technique, supplemented by advice from the manufacturer, will be sufficient to perform the hard-facing with excellent results.

Hard-facing can be welded to all ferrous metals, including manganese steel, alloy steels, cast iron and chilled iron. For best results, the application requires a clean, smooth surface. All loose scale, dirt, rust, paint and other foreign matter is removed, using a wire brush. In some special cases a grinding wheel may be necessary.

The point of application can be determined very quickly. Hard-facing should be applied at those points where wear is greatest. If the part is badly worn, no attempt should be made to hard-face the bulk of the worn material. Instead, as stated above, a cheaper base metal should be used, of a type and grade similar to that originally used. After the part has been rebuilt almost to original dimensions, the hard-facing coat can be applied, allowing enough excess to permit grinding down to the original dimensions.

Rods designed for electric arc application are coated with a material that gives a smooth arc, making possible a uniform, non-porous deposit. No slag is left on the surface of the deposit, so that no cleaning between passes is necessary.

Either DC or AC may be used, the amperage varying with the diameter of the rod. DC currents require from 150 to 300 amperes; AC currents require from 160 to 320 amperes. These current requirements are only suggested, of course, being based on service records. They will vary largely with the thickness of the overlay. The welder will soon discover that his judgment in the matter is the best guide. For DC the current is reversed, making the Weld Rod (electrode) positive, and the part to be coated negative.

A weaving bead, ½-in. to 1-in. wide should be used. It is unnecessary to peen the deposit, or use quenching. The usual deposit is about ⅛-in. thick.

After depositing an overlay, it may be necessary to reduce the surface of the part in order to reach original dimensions. Grinding in these cases can be easily done with standard wheels.

Examples of Economy

Outstanding performance records by hard-facing have been achieved in refinishing and maintenance work on all forms of excavating and earth-moving equipment.

In one case involving an Indiana road-widening project, the figures show approximately $13.73 was required on each mile. This sum was based on recoating the 96 teeth of the bucket every six miles, and included time required for disassembly, transportation, hard-facing and re-installation of the teeth into the bucket.

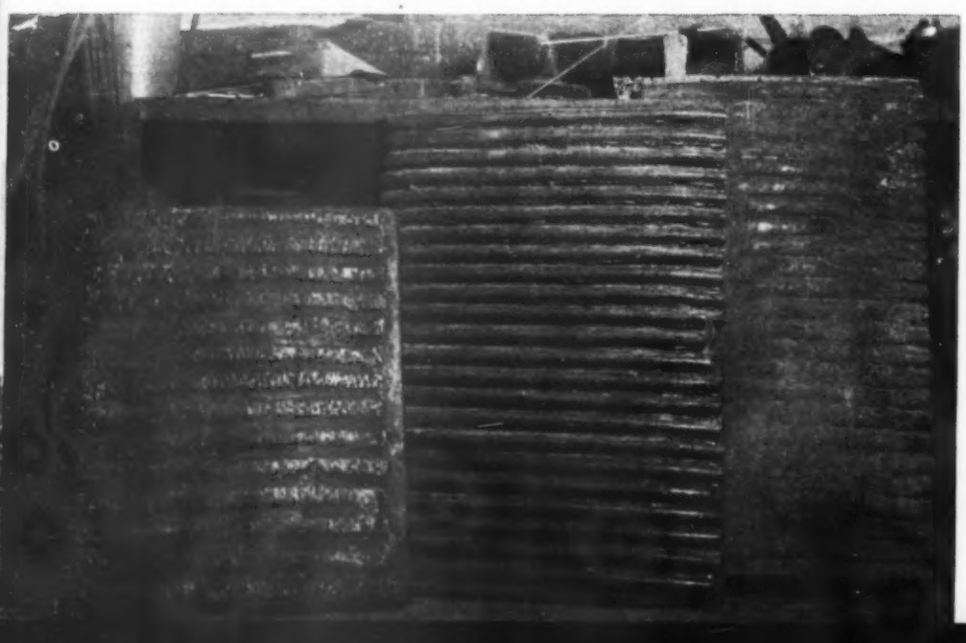
In another instance, the bucket line of a ditch digger was hard-faced with a recommended alloy. After 130,000 feet of ditch digging, the bucket line surface had been smoothed, but showed no appreciable wear!

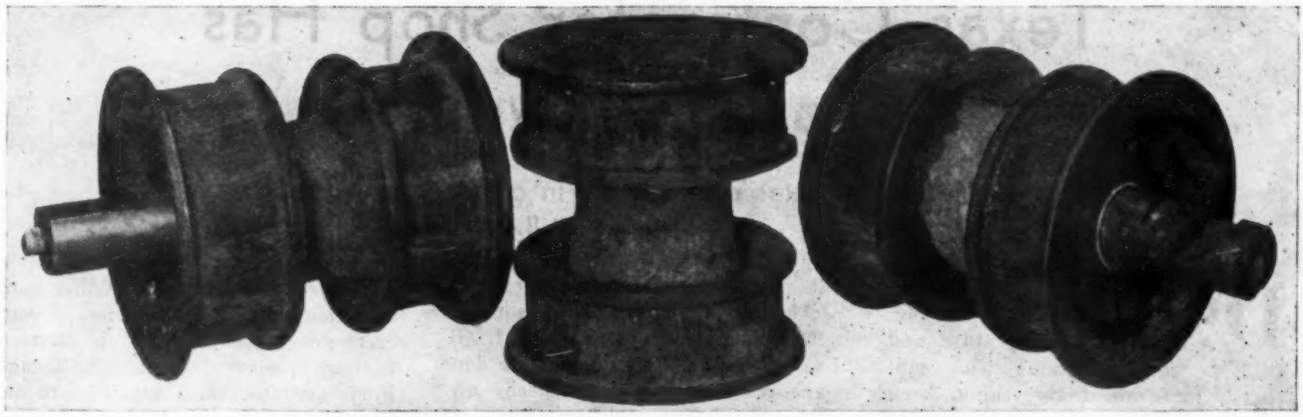
In still another case, a set of scarifier teeth on a grader, refinished with hard-facing, gave a full day's service of about 30 to 35 miles before renewal of the coating became necessary.

Tractor rolls wear out quickly on contact with dirt and sharp sand. The average quantity of metal required for such a job is about 2 pounds per roll, or 4 pounds per pair. Welding time is from 30 to 45 minutes. The approximate cost, including labor, of hard-facing a new roll is $6.75. For rebuilding and hard-facing a worn roll, the cost would be about $13.50. The hard-faced rolls will last two to five times as long as a new one which sells for about $19.00. Thus, in addition to all other advantages, a considerable saving is effected.

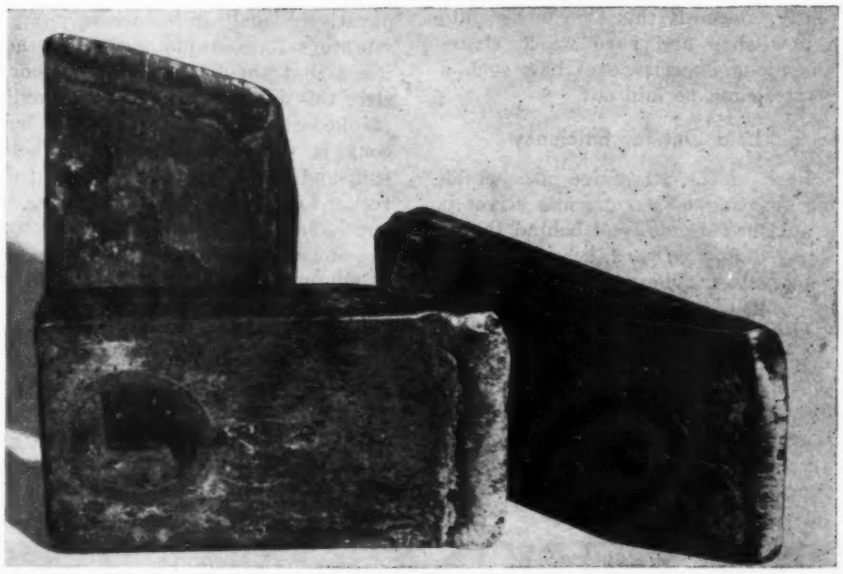
Some users have reported that the best results are obtained by hard-

Jaw Crusher Plates. On right, worn corrugated plate. In center, plate rebuilt with manganese steel bars, which will be faced. On left, smooth hard-faced plate





Hard-faced double flanged steel tractor rolls for D-8 Caterpillar tractor



Hard-Faced Ditcher Teeth. It required only one pound of 1/4-inch road to coat 21 teeth. The welding time per tooth was 1 1/3 minutes. Notice how hard-facing applied to the leading edge has kept the points of the teeth sharp

facing new teeth. With an overlay they give better wear, and can be more easily refinished after slight wear. Waiting until expensive wear has set in is not necessary.

The story could be repeated with numerous examples. Road levellers, bulldozers, graders, concrete mixers, tamps, dredge pump impellers—all of these can have their usefulness and efficiency restored by proper hard-facing.

These applications and field reports all point clearly to one fact, i.e., operators of excavating and road building equipment can profit by the application of hard-facing. These times are placing serious strains on equipment, thus making proper maintenance a necessity—which is being served by hard-facing. After V-Day has come, its use will remain with many operators as standard good maintenance practice.

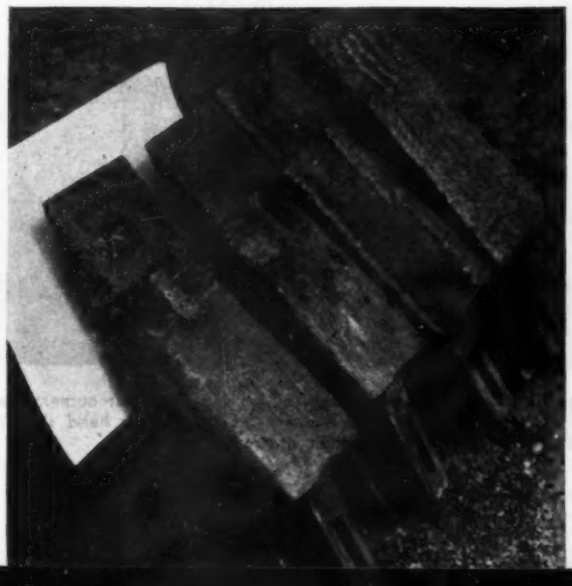
▼

Trucks in Use Only 3.48% Below 1941

A total of 4,393,329 trucks and commercial vehicles were in operation on the highways of America during 1944, a decline of only 3.48 per cent from 1941, R. L. Polk & Co. has reported in announcing the first compilation of official truck registrations since the beginning of the war.

This decline is much lower than that of passenger car registrations for the same period, which suffered a 13.2 per cent drop.

(Left): Shovel Teeth. Shows progressive stages in salvaging work teeth by repointing, with manganese wedge bars, followed by hard-facing. (Right): Dragline Bucket Teeth, 14% Mang. Steel. The beads of hard-facing have worn down to the base metal on the tooth points, but have not chipped off. The hard-facing can be easily renewed



Texas Contractor Shop Has Modern Layout

Notes on Texas contractors in general and on L. H. Lacy's new place at Dallas in particular

DOWN Texas way, people have a tradition of thinking big. After all, it's a big state, and still a "new country," with rip-roarin' ideas about everything, from oil well drilling to beef raising to road building.

Texas contractors, particularly, are thinking in big, bold terms. They're fresh from a multi-billion-dollar job of constructing airfields, military bases, munitions plants and access roads. (Texas probably has ranked first among the states in war construction volume.) These fellows are now eyeing the state's $200,000,000 postwar road building program. Also a huge backlog of street paving and municipal work, along with all kinds of heavy postwar construction.

One result of the war experience and the excellent outlook is that an increasing number of contractors have grown into modern business organizations. As one leading contractor puts it, "We've quit thinking of our business as just a succession of jobs, but rather as a continuing organization seeking a certain volume of work.

One such contractor is the L. H. Lacy Co., of Dallas, which has done some record-smashing in speedy airport construction and has upward of a million dollars' worth of highway widening and repair contracts currently. Recently this firm moved into a new shop and yard which represents long experience in how such a plant should be laid out.

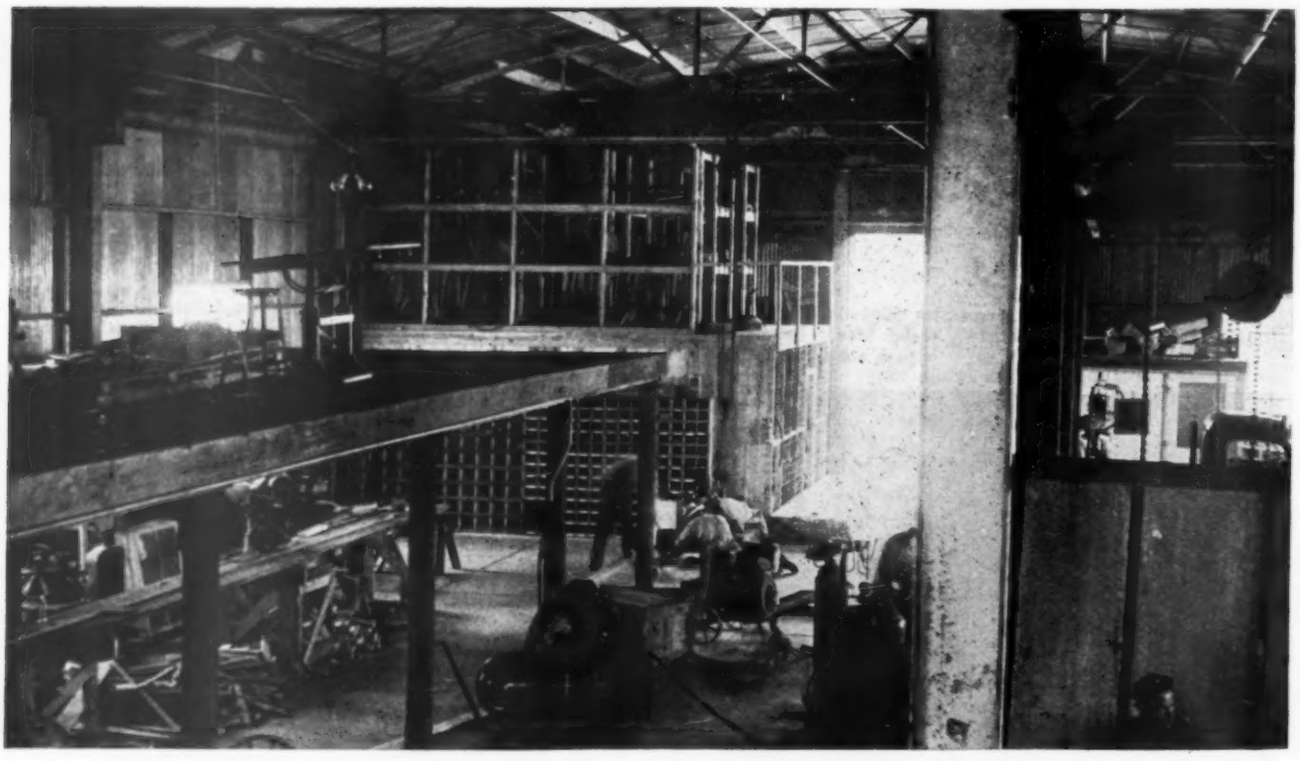
Laid Out for Efficiency

Back of the attractive office building fronting on a suburban street is a 50x100 ft. shop, and behind this is a paved storage yard, accessible from a side street. The yard is in the form of a long, narrow, fenced-in strip, being virtually a wide stone-covered roadway. Since the entire layout is conspicuously visible from an adjoining arterial highway, special care is taken to keep all stored equipment arranged in neat, orderly rows for good appearance.

The shop is of mill building construction and, of course, has a concrete floor throughout. It is planned for quick, convenient access. Storage items and stockroom supplies are delivered through a wide end door (see layout). About one-fourth of the floor area is reserved for storage of comparatively small units such as pumps, vibrators, crated motors, and other items that should be housed indoors. Over this area is constructed a heavily planked storage balcony. This balcony is served by a separate hoist rail, and units can be transferred directly to or from delivery trucks in one handling, trucks backing through the end door and across the open receiving-area floor to a point under the chain hoist.

A rear corner of this storage area is closed off with heavy woven wire fencing; here scraper and truck tires are stored under padlock.

In a corner up front, conveniently near the delivery door, is a double-deck stockroom, also caged with heavy



Looking toward the receiving door end of L. H. Lacy's new shop. Note storage balcony at left, and crane rail serving it. In far corner, near main door, is an enclosed stock room. Additional stock bins are arranged on the outside wall, and above are more racks for hand shovels, brooms and other small, less valuable items. Repair bays at extreme right have their own craneway

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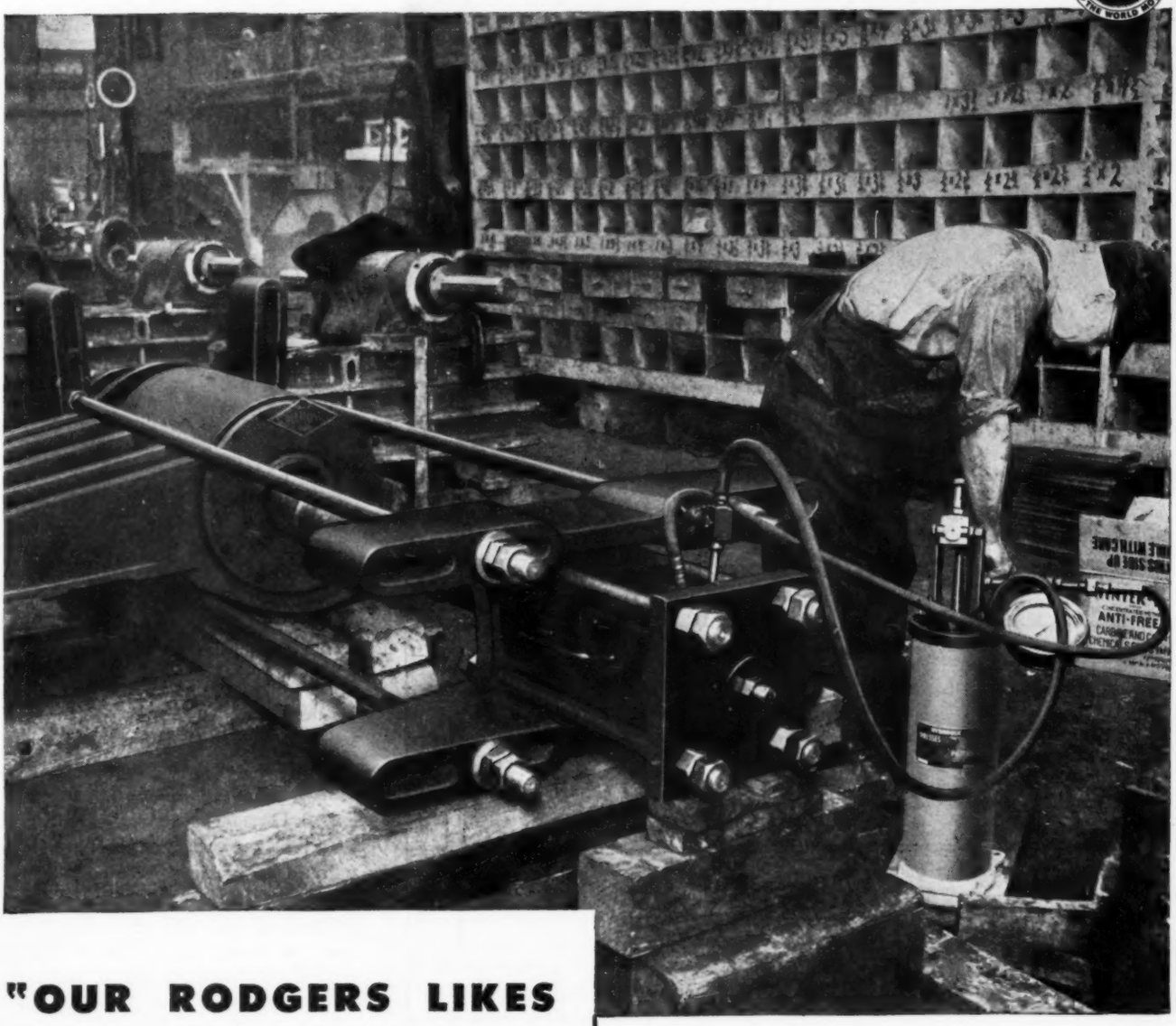

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Rodgers special 200-ton unit forcing bearings and sleeves from the pitman of a Diamond rock crusher.

"With 200 tons of push behind it, our Rodgers Universal Press really does a job, servicing our equipment. Removing bearings and sleeves on the crusher pitman shown in the photograph was simply a matter of setting up and letting the Rodgers take over."

The Diamond Iron Works Inc., Minneapolis, relies on its Rodgers Universal Press. Like other users, it appreciates the portability and adaptability of the Rodgers, which does the job wherever pressing, pulling, or lifting power is needed. For complete information and prices, write or wire Rodgers Hydraulic, Inc., 7401 Walker Street, St. Louis Park, Minneapolis 16, Minnesota.

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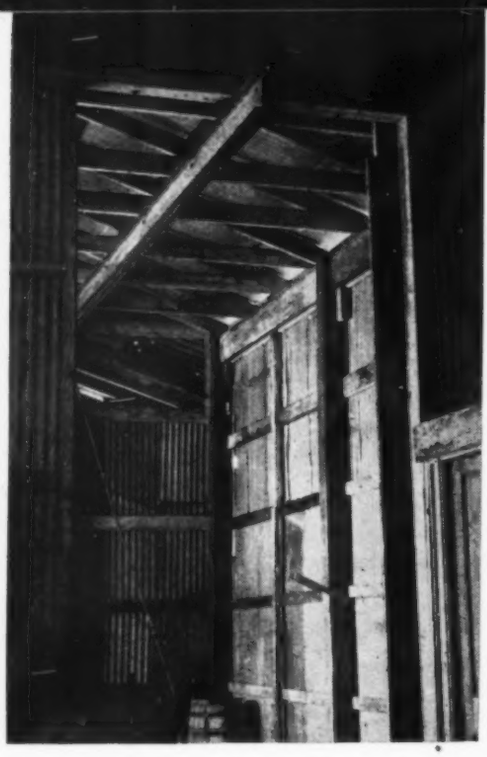
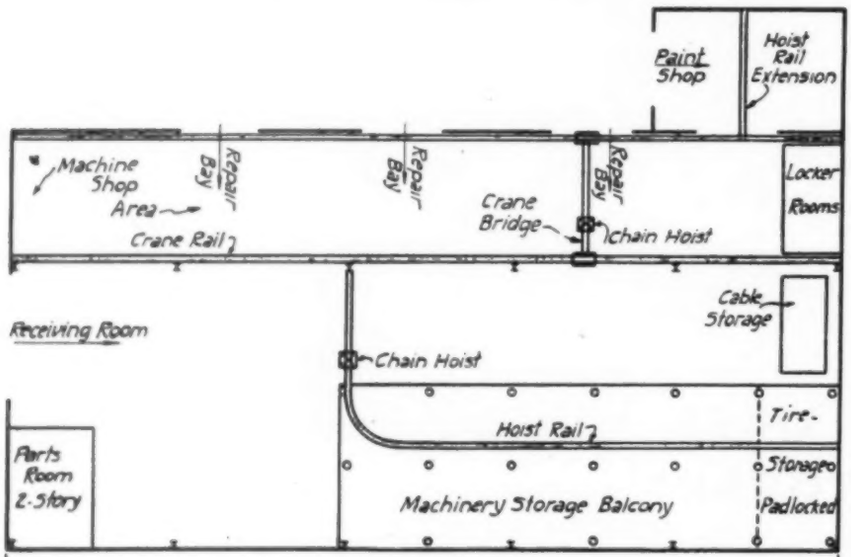


(Left): Lowering a pump and hose from storage balcony directly into truck bed

(Right): Rail along which suspended parts can be shunted from craneway into adjoining paint shop



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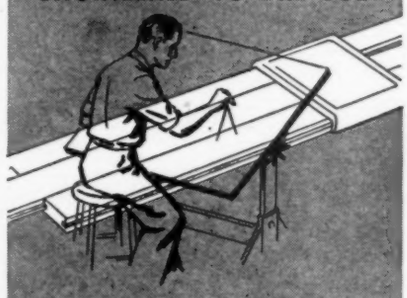
woven wire. The L. H. Lacy Co., however, is like other contractors in that it keeps only a minimum stock of parts and supplies.

Heavy Repair Bays

Planned with equal care are bays for the repair of trucks, tractors, scrapers and other heavy equipment. Three side doors lead into bays across which runs another overhead crane system. This craneway (again see plan sketch) consists of a heavy-duty chain hoist which trollies along a traveling I-beam, which in turn travels along parallel I-beam rails extending the full length of the building.

WGB CLAROFIERS

ENGINEERED TO THE JOB



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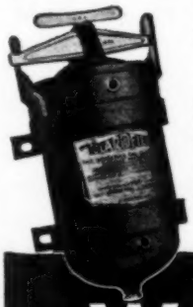

The free WGB book explains oil-clarofying, illustrates various WGB models for gas and Diesel engines. Send for it.

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BUSTING ROCKS

...not the buster points!

DRIVEN by a 14 ton shaft! Dropped 9 feet four times a minute! You couldn't think of more severe service than that to which these rock buster points are subjected! Yet they are standing the gaff. Because of their Coast Metals hard-facing, they possess exceptional resistance to impact, shock and wear. And give several times the life of ordinary points!

Coast Metals hard-facing is equally applicable to new parts or old ones, of any ferrous metal, including manganese steel, cast iron and chilled iron. Easy to apply — by the electric welding arc or oxy-acetylene torch.

Let our engineers show how you can use Coast Metals hard-facing to keep your equipment on the job without frequent time out for repairs or replacements!

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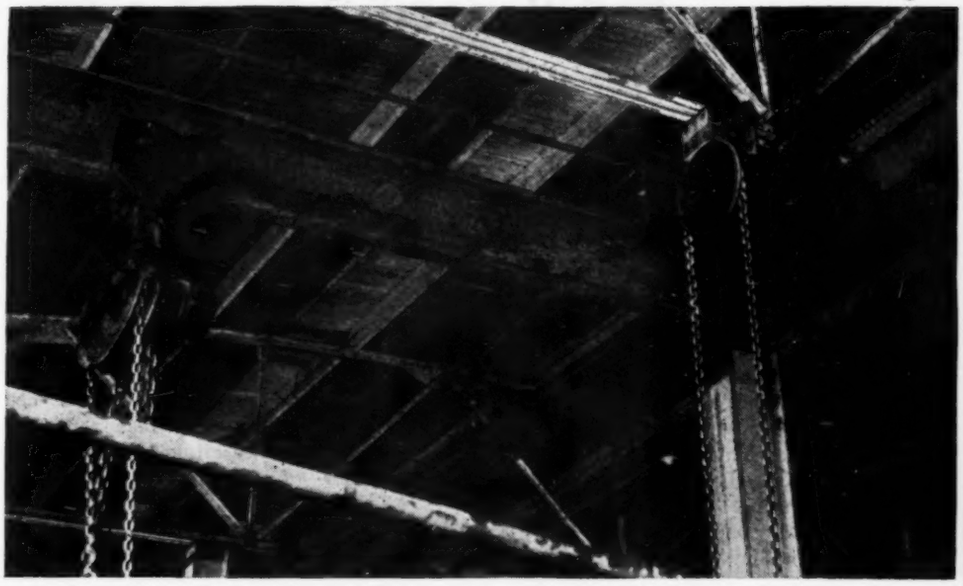
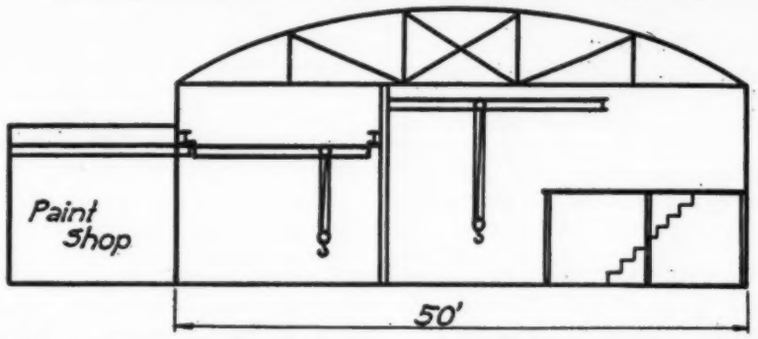
hard-facing weld rods
MAKE YOUR EQUIPMENT LAST LONGER



Details of shop-made traveling crane bridge and craneway over repair bays. The chain at the right is hand-operated from the floor to propel the bridge along



The hoist rail system was designed and built by the shop force, using structural or salvage parts. The hoist unit travels along the bridge on a two-wheel trolley which rides the lower flange. The bridge, in turn, is suspended from two-wheel trolleys riding the top of the parallel rails. A worker standing on the floor below moves the bridge as desired by pulling down on an endless chain, this chain turning a sprocket geared to the trolley wheels.

Of special note is that a hoisted part can be moved conveniently into an adjoining paint room, simply by running the bridge down to a wall opening and shunting the loaded hoist onto an extension rail which leads across the paint room ceiling (see photo).

A modest layout of lathes and other machine shop equipment is located under the craneway at one end of the building. And all shop welding is done with portable equipment. Thus the entire shop is arranged to expedite storing, shipping out, servic-

The new Lacy home office—in front of which is proudly displayed the firm name and AGC insignia

How Army's "XYZ" Highway Speeded Victory

FOUR American armies were supported in their dash into Germany by an express highway system so efficient and flexible that about 9,000 tons of urgently needed supplies, plus several thousand tons of bulk petroleum products, reached the front every day.

Devised by the Army Transportation Corps, in cooperation with Communication Zone sections and the Armies, the new system was known as the "XYZ Highway," according to a War Department bulletin. Trucks moved on a 24-hour-a-day schedule, stopping only for loading and maintenance. Two drivers were assigned to each truck, one man with the truck at all times.

Big Trailers Used

Using 5 or 6-ton truck-tractors hauling trailers with a 10-ton capacity, more supplies were delivered to Allied armies in Germany over the XYZ Highway than were delivered either by the "Redball" or the "ABC" highway systems, even though far greater distances were involved because of the advancing Allied spearheads. (The Redball Highway followed the Third Army from the Normandy Peninsula to Paris and beyond, while the ABC system originated at Antwerp and ended at depots in Germany).

Closely controlled express highway routes were laid out to each army. The routes were established with sufficient flexibility so that their terminals and routes could be altered as the tactical situation demanded, and trucking units could be transferred from one to the other without delay. Trucks ran from railheads in or near Germany to forward areas from where the supplies were taken directly to the depots of individual army units. Truck marshalling yards, strategically located in relation to the railheads and depots where the routes originate, were set up for each army.

The marshalling yards acted as control points and checked out the 16-truck convoys. Truck tractors moved empty trailers to railheads and depots and returned to the marshalling yards with loaded trailers. There the convoys were made up and other tractors were hooked to the trailers to transport them to forward areas.

Traffic was controlled on the highway by radio and telephone communication. Roads were patrolled by MPs and were clearly marked with signs prepared weeks in advance of the Allied offensive. Teams of Engineers keep the roads constantly under survey and repair, and ordnance maintenance units keep the vehicles in maximum operation.

Huge Tonnage Moved in Three Phases

Tonnage carried over the XYZ Highway exceeded the daily average of the earlier Redball and the ABC Highways. The ABC Highway closed on March 26, 1945, after carrying 244,924 tons in its 117 days of operation. The Redball Highway, which operated 81 days and carried more than 500,000 tons, closed November 13, 1944.

The Army's 2½-ton, 6x6 cargo truck was the workhorse of the Redball and ABC Highways; but the XYZ has depended primarily on truck-tractors—t r a i l e r equipment. Even tank retrievers, prime movers capable of moving more than 30 tons of freight, have been used on the XYZ system. Some of these trucks belonged to truck companies which operated the Motor Transport Services' supply route through Iran to Russia until recently. Smaller 2½-ton trucks were used on tributary routes.

The three-phase system from which the highway derives its name was set up to meet the three stages of tonnage requirements. Supply demands of the armies determined which phase was in effect and how many trucking companies were to be employed.

Under "X" phase, 8,000 tons were delivered to the armies on a two-day turn-around of trucks, or 16,000 tons per day on a one-day turn-around basis. The determining factor for the turn-around was the length of the run.

The "Y" plan called for movement of 10,000 tons on a two-day, and 20,000 tons on a one-day turn-around; the "Z" plan for 12,000 and 24,000 tons. A daily commitment of several thousand tons of POL (Petroleum, Oil and Lubricants) moved on a one-day turn-around.

Two Highway Transport Divisions (provisional) of the Transportation Corps' Motor Transport Service directed the operations. One, commanded by Col. Hugh A. Tolman, of Bryan, Ohio, former commanding officer of the ABC Highway, supported the First and Ninth Armies. The other Division was commanded by Col. James McKinnon, Talladega Springs, Alabama, Deputy Chief of the Motor Transport Service; this unit supported the Third and Seventh Armies.

A special word should be said for the 303rd engineers with the 78th

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(*Continued from page* 103)

ing and repairing with a minimum of handling, lost motion and manual labor in general.

Naturally much of Lacy's repairing will be done in the field. Full use will be made of commercial machine shops where economical, and less salvage work will be done as the parts situation returns to normal.

Rebuilding the hopper bottom of a material batching bin. At left is old rusted part, at right new bottom plates being welded. Typical of extensive salvage work performed in the Lacy shop

Getting results...in a BIG way!...

In 1939, when Hitler struck at Poland, trucks took only a few hundred thousand tons of ore from America's iron mines. *In 1944, trucks hauled out* OVER 50 MILLION TONS!

This ore plus scrap metal makes over 35 million tons of steel . . . more than all the steel in all passenger cars now on the road. It is steel enough for almost a million medium tanks . . . or over 110 million 50-cal. machine guns . . . or 15 million big 16-inch Navy shells . . . or more than 800 mighty battleships.

Huge 6-wheel, 30-ton capacity Macks like the one shown below, as sketched by Peter Helck, are doing a lion's share of this big ore-hauling job.

The biggest trucks in standard production today . . . these Macks have *lowered* open pit mining costs, while time and again setting new production records on the job.

Their work is typical of the many, many ways in which Macks, both big and small, are serving the people of America . . . and helping their owners cut costs.

Their stamina is a good example of why Macks for 44 years have been America's No. 1 line of trucks for tough hauling jobs.

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Mack Trucks, Inc., Empire State Building, New York 1, N. Y. Factories at Allentown, Pa.; Plainfield, N. J., New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts.

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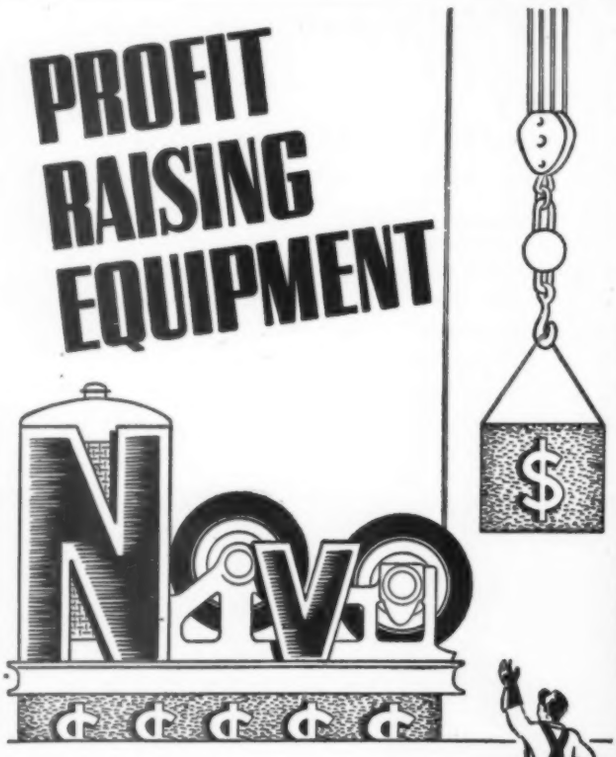
TRUCKS
FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS

Performance Counts!

PROFIT RAISING EQUIPMENT



To raise the profit on a negotiated contract . . . the cost must be kept down! One sure way to reduce cost is to replace hand labor with efficient machinery. Novo Contractors' Equipment is that sort of machinery . . . efficient, economical and dependable!

Novo's complete line of Contractors' Equipment includes Engines, Self-Priming Pumps, Diaphragm Pumps, Hoists, Generator Sets, and Pavement Breakers. They are all labor-savers . . . money-savers!

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LANSING 3, MICHIGAN

Infantry Division. This outfit did a road repair job of a magnitude and scale of difficulty almost beyond the imagination of peace time maintenance engineers.

The job was to beat Old Man Mud, to keep trucks and tanks and big guns moving up front. Seemingly endless miles of oozing mud impeded progress. This mud along with holes chewed by heavy trucks and tanks had to be hastily blanketed over with stone, followed by a wholesale job of crush stone application. Hundreds of battalion men worked on the roads themselves, or in quarries operating crushers and loading shale and stone into trucks.

Commanding the 303rd Engineers was Lt. Col. John J. Closner Jr., of San Antonio. In direct charge of the road job was his operations officer, Maj. William J. O'Connell, of Webster Groves, Mo. Battalion executive officer, Maj. Harry E. Gerleman, of St. Louis.

▼

Oregon County Plan Future Highway Work

Jackson County, Ore. (Medford), has prepared a $3,000,000 postwar program for five years, County Engineer Paul B. Rynning announces.

It calls for 52 miles of road grading at $1,000,000; 86 miles of rock resurfacing at $750,000; 85 miles of road oiling at $400,000; six large bridges costing $200,000; 70 small bridges costing $150,000 and $500,000 for road maintenance. The county has $285,000 in a sinking fund for the projects.

▼

Army engineers used 100 ten-wheel trucks to haul coral in the construction of two 8,500-foot runways on Saipan. Heavy mats and all engineer equipment was landed from LST's under a two-hour strafing from Jap aircraft.

▼

(*Continued from page* 94)

man, hunting always for a good "deal" in return for the state's road funds. Getting the best job out of a contractor organization isn't just a matter of cold specifications, dimensions and materials. It's a problem in human relations. The old saying that honey will catch more flies than vinegar applies to the problem of getting the best work out of a contractor's crew.

Higher Prices Ahead

Many of the things that go into building a road should be fairly stable in price after the war. An exception is lumber. Good lumber is sure to be an increasingly scarce article and we'll see greater use of

McCAFFREY TRACTOR SHOVEL

WITH RUD-O-MATIC CONTROL

These Features Make It Your Best Choice—

100% CABLE CONTROL OF BUCKET
Permits gradual dumping of the load.

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WEIGHT CENTERED ON TRACTOR FRAME—

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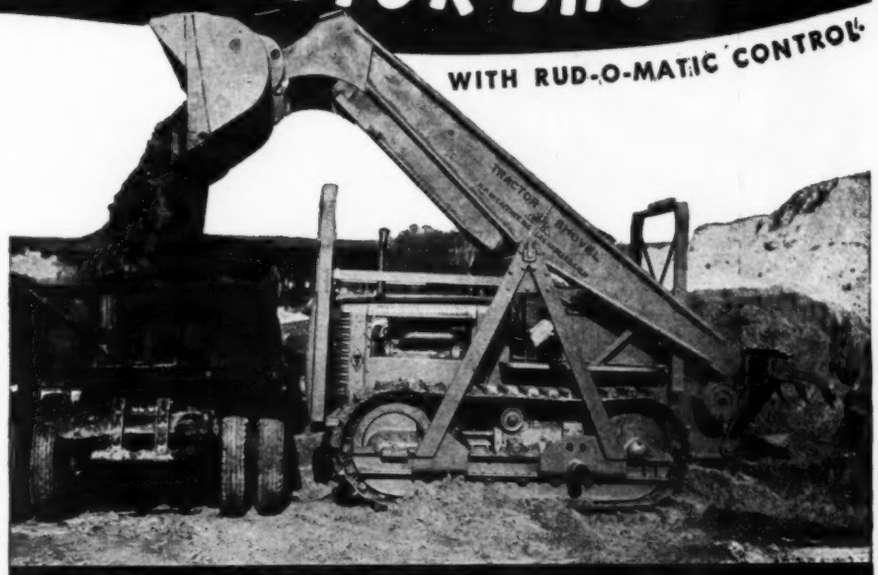

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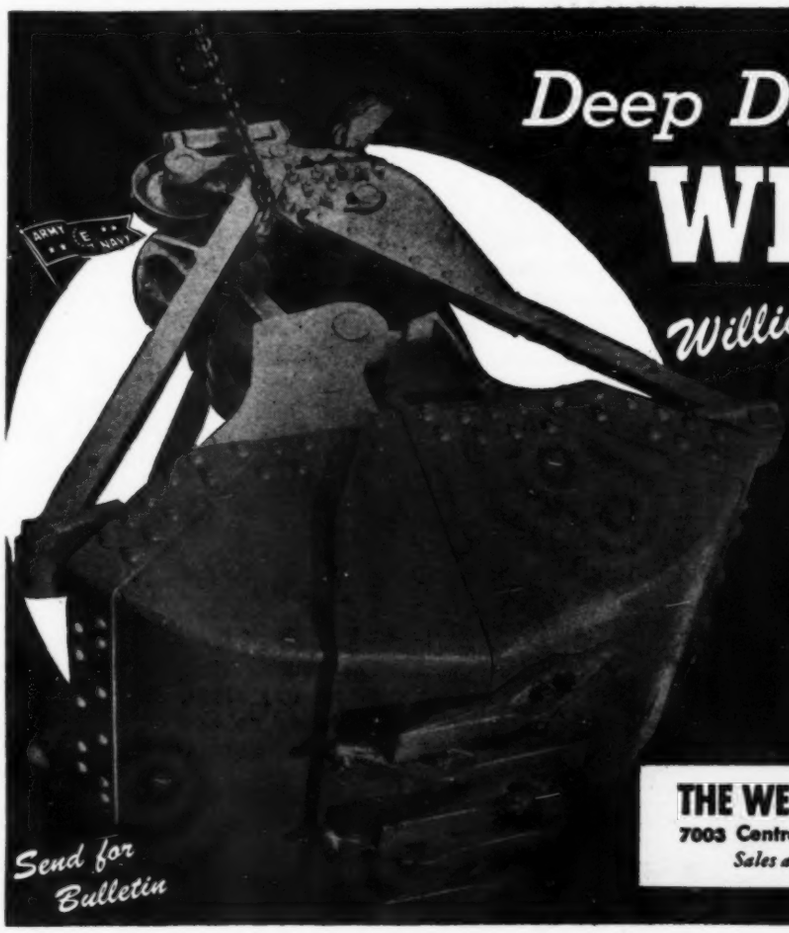

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Wellman Buckets, in Power Arm and Multiple Rope Types develop great digging power. They bite into frozen ground, hard clay or shale, and come up with full loads.

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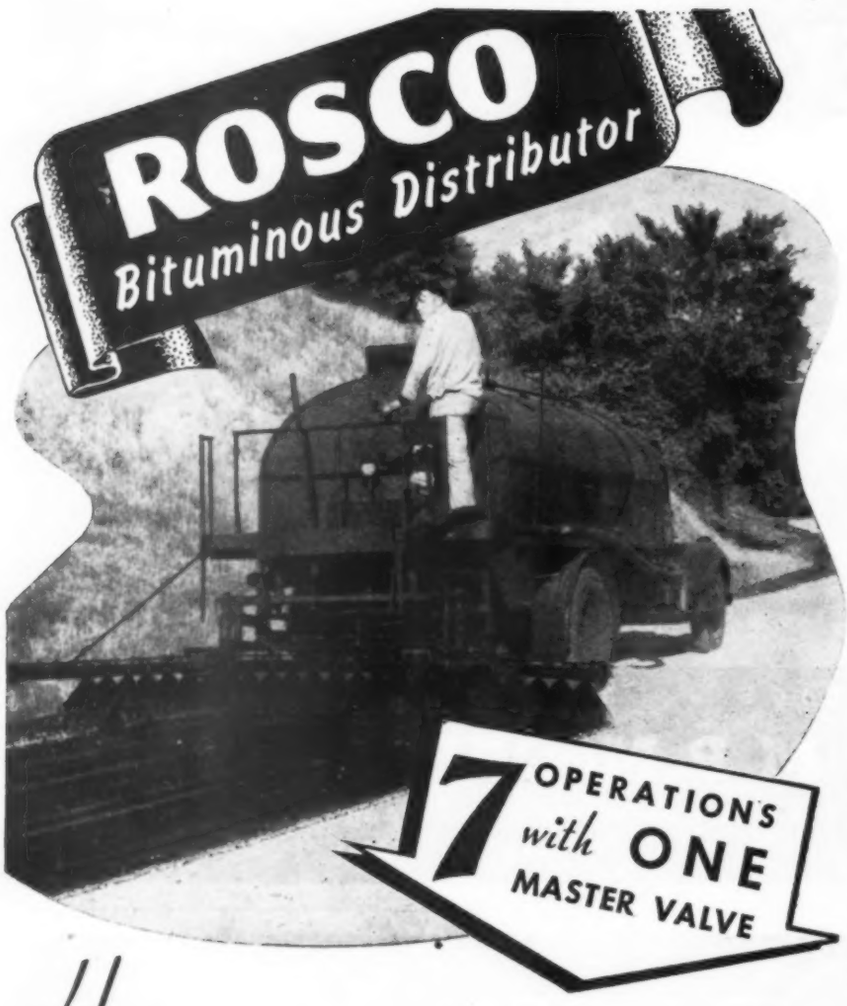


Here's a tried and proven method of black top application. The Rosco Pressure Control method accurately applies bitumen *from 3/100 gallons to 3 gallons per square yard!* Further, it automatically compensates for any changes such as clogging or spray bar length.

The Rosco Patented Master Valve Serves you these seven ways: Starting spray . . . circulating . . . loading . . . transferring . . . pressure control . . . clean out . . . cut-off. Reverse suction makes a clean cut-off at nozzles—no drip.

And the original folding spraybar is equipped with 4 sections, vertical lift and shift, horizontal bar pivot for safety. Sump type suction, tell-tale loading gauge.

Another exclusive Rosco feature is front mounting of master valve pump and engine—balances load weight, provides safe and roomy rear platform and low maintenance cost. All in all, the Rosco Distributor is as nearly automatic as modern engineering can produce. See your Rosco dealer, or write us for complete information.

★ ★ ★ ★

ROSCO MFG. CO. • 3118 Snelling Avenue • Minneapolis 6, Minn.

steel and other materials, sometimes at higher cost. Other cost items, too, will be higher. Equipment prices are likely to be up about 25% because of high factory labor costs.

But highway departments will see plenty of competition. It is foreshadowed now in the big bid lists of 1945 Texas road work. Fifty sets of plans went out on one current Texas paving job.

Gets Plans Ready!

That's only indirectly our worry, but it's your main job right now as engineers. In many states the preparation of a shelf of construction plans has lagged in spite of a wide realization of the need. As contractors, we say, get going on your plans now, and when the time comes to go ahead, we'll give you your money's worth!

▼

(*Continued from page* 96)

Basich's field repair shop, being far from the Los Angeles home office, was equipped to be self-contained, having bench tools but no lathes. In a year's time the shop crew overhauled all the tractors and two score trucks. About $20,000 in parts was carried in stock, according to P. R. Kisich, of the contractor's equipment staff. The outfit, including trucks, was as nearly 100% diesel as it could be made, and a factory trained diesel mechanic was kept on the job at all times. About 400 men were employed on the road project at the 1942-3 peaks and up to 200 during 1944.

The Navajo Ordnance Depot is a U. S. Engineer project, begun under the Albuquerque District and completed under the Los Angeles District Office.

Snow Removal, Big-Scale Job

While other parts of Arizona are dry and mild, the Flagstaff area is one of heavy snowfall, with 90 in. mean and 180 in. recorded maximum per year. The Depot, under the Post Engineer, has $175,000 worth of modern snow-fighting equipment which includes:

7 heavy-duty, one-way plows with 235-h.p. twin-engine trucks, two plows having rotors in wings
5 small screw-type blower units
11 heavy V-plows
5 fan-type rotaries
3 motor graders
4 dozers

The bulk of the plowing is done with one-way plows, which clear 22 ft. wide and up to 8 in. depth at 12 to 15 mph. Blowers are used in the administrative street area and on dock and igloo aprons.

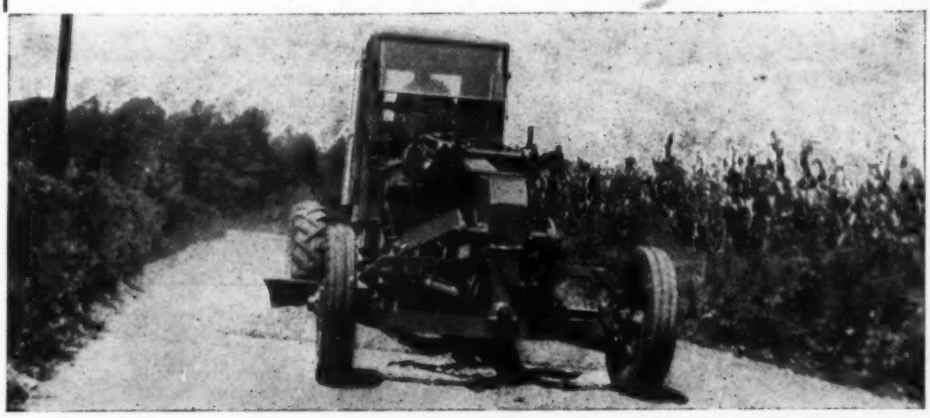
The importance of prompt snow clearance at an ordnance depot in wartime can hardly be over-emphasized. Each evening the Depot's ship-

WARCO MOTOR GRADERS

For all-around work—Heavy Construction, Banksloping, Ditching, Blacktop, Maintenance—they'll give you economical and lasting service. All this—

plus

Powerful medium and heavyweight Chain Driven Tandem Drives, whose power wheels assure *positive* traction under extremely adverse conditions. WARCOS stay on the job through toughest going, with enough power to whip the most discouraging and seemingly impossible obstacles!



Easy Hydromotor Control of all blade movements. Instantly available power in hydraulic lines. Such positive and exact blade control that follow-up work is practically eliminated.

Bulletin No. 4300

W. A. RIDDELL CORPORATION, Bucyrus, Ohio

Outstanding for

SERVICEABILITY

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OPERATING CONTROL

to

TAILGATE

Write for the names of nearest PERFECTION distributors.

Every part of a Perfection Steel Dump Body and Hydraulic Hoist is designed and built to stand the gaff of constant service and rough and tough assignments.

Oversize and extra heavy parts where needed . . . modern construction methods and design of proved superiority . . . careful workmanship —all are reflected in PERFECTION's top performance and trouble-free service.

ARMY E NAVY 5th CITATION FOR WAR PRODUCTION

THE PERFECTION STEEL BODY CO. GALION, OHIO

PERFECTION

TRUCK BODIES AND HOISTS

You'll Never Have to Run an Ad Like This as Long as There's

SISALKRAFT

WANTED

We are in the market for a tough, weatherproof, tear-resistant curing material. It must have proved itself the "Number One" concrete curing agent for newly poured concrete roads, runways, etc. It must be a material that will save time, manpower, and money . . . that can be laid with speed and ease by two men. It must be so durable that it can be used over and over again. It must be time-tested and field tested and in the specifications of at least 40 State Highway Departments. Address replies to "Alert Road Builders", Anywhere, U. S. A.

Here are a few of the Many Sisalkraft Uses

Cover and protect road mix . . . over newly poured concrete to protect against drip and debris . . . cover stock piles . . . protect concrete from frost . . . as a lining for construction shanties . . . for all-round job protection.

THE SISALKRAFT CO. 205 W. WACKER DRIVE · CHICAGO 6, ILL. NEW YORK · SAN FRANCISCO · LONDON · SYDNEY

Manufacturers of SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

ping branch furnishes a list of the igloos that will be used the following morning. Then while one crew opens up main roads throughout the area, another crew goes after igloo service roads, taking the spotted igloos first.

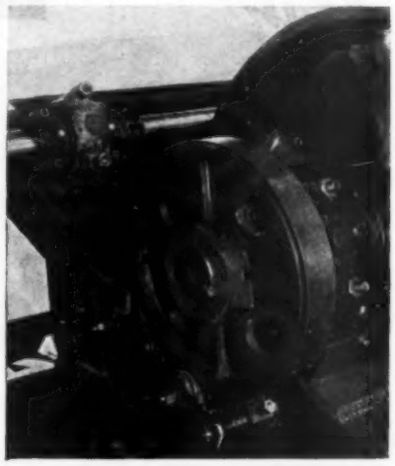
Plowing usually begins when snow reaches 4 in. depth. At the first hint of storm the crewmen living at Flagstaff 12 miles away are called out, with two hours' allowance for getting going.

It is a point of pride with the Post Engineer that no movement of trucks has ever been held up by snow. In order to make this statement possible, the snow crews under a general superintendent have sometimes worked 36 to 48 hours during storms practically without rest.

New Equipment and Materials

New Back Stop for Belt Conveyor

A shoe acting directly on the brake drum is one of the unique features on a new, greatly improved differential band-type back stop just announced by Barber-Greene Co., Aurora, Ill., manufacturer of belt conveyors and other material handling equipment. The new back stop, available in 12 in., 18 in. and 24 in. diameter drum size, is said to be the most simple, trouble

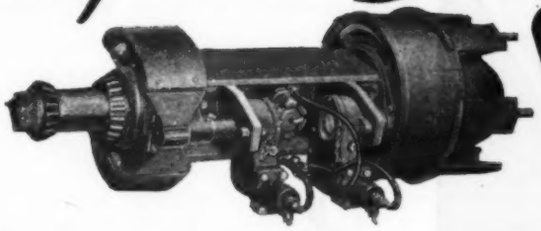


A 24-in. differential band back stop on a permanent conveyor installation. Cover has been removed to show brake band, drum and connecting mechanism

free back stop yet devised for preventing belt conveyors or bucket elevators from running backwards due to this belt or bucket load when, for any reason, the power is shut off. Tested for over a year in the field, these new differential back stops are stated to have many unique features

WITH LOADS LIKE THIS...

YOU NEED SAFE, SURE *Hydraulic Brakes*



JAHN *Heavy Duty* TRAILERS
in Capacities from 5 to 100 TONS

CONTROLLING a massive trailer, fully loaded as this one is, demands reliable brakes that really stop. The new Jahn hydraulic brake application for heavy duty trailers provides smoother, faster braking action, even under the most punishing burdens, with positive, equal brake pressure on all wheels. Uneven terrain has no effect on them—full axle oscillation can take place without any reduction in braking efficiency. There is no possibility of partial application or dragging of brakes, never any added resistance for the prime mover to overcome.

Thoroughly tested in actual service, all Jahn heavy duty trailers are now available with these powerful, fast-acting hydraulic brakes. Make sure your postwar trailer has this added safety factor. Write today for details.

C. R. JAHN COMPANY

1345 WEST 37th PLACE, CHICAGO 9, ILL.

Capacities from 5 to 100 tons . . .
Any axle or wheel combination

PRACTICAL BOOKS for PRACTICAL MEN

Books for Engineers and Contractors written by men who have had actual experience as contractors and engineers.

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By V. J. BROWN; C. A. HOGENTOGLER, senior and junior; FRANK H. NEWMAN, jr.; C. M. LANCASTER; E. S. BARBER. Compiled from a series of articles written for Roads and Streets magazine by a group of well-known highway engineers. The demand for this book has been world wide. It is a vital need for the engineer considering low cost road improvement or grading embankment control. Profusely illustrated—141 pages—$2.00 plus postage.

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10,000,000 *cu. yds.* of Mass Concrete Placed by JACKSON VS-4s On TVA Dams Alone

VS-4s IN USE ON GRAND COULEE DAM

JACKSON

HEAVY DUTY INTERNAL VIBRATOR

Contractors eyeing the many dam projects proposed as part of the postwar construction program can rely on JACKSON VS-4 Mass Concrete Vibrators as the outstandingly efficient machines for thorough and speedy compaction of the harsh and stiff mixes used in this type of concrete construction. JACKSON VS-4s are noted for dependability and low cost maintenance, under practically continuous operation... Big jobs where JACKSON Mass Concrete Vibrators have made outstanding records include TVA Dams, Grand Coulee, Madden, Pine Canyon (Samuel B. Morris), Conchas and Tygart Dams, to name just a few. Experienced contractors and engineers on the huge postwar hydro-electric and reclamation programs will select JACKSON VS-4s because of their performance records.

THERE IS A RIGHT JACKSON CONCRETE VIBRATOR FOR EVERY JOB

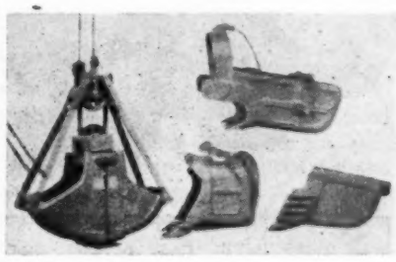
ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

which provide more frictional area, require less tension in the band, remove practically all danger of bending of the shaft, and require a much simpler anchor than any other brake of equal size. Instead of the brake band taking all the torque required to hold the conveyor, the shoe takes an appreciable part of the load. When the differential acts and the band tightens, the shoe is pulled up against added friction (18 per cent to 20 per cent additional drum circumference is brought into contact through use of the shoe). Less frictional resistance of the brake band itself is required.

▼

New Dipper and Buckets

Pettibone Mulliken Corporation, 4700 West Division St., Chicago 51, Ill., has announced a new Big 4 line of material handling dippers and buckets. For many years this firm has occupied an important position in the coal and iron mining industry as manufacturer of large size welded



New Line of Buckets and Dippers

dippers, and for the past few years they have produced welded dippers in sizes down to ⅜ yd. capacity. At present, practically the entire production of these items is going to the armed services with top priorities, but a limited output still is going to the domestic market. After the war, popular sizes will be stocked. There are interchangeable teeth on ½ and ¾ yd. sizes of all the buckets except the clamshell.

▼

New 5 Hp. Engine

A 5 hp. air-cooled engine stated to embody principles new in small engine design has been announced by Kinner Motors, Inc., Glendale, Calif. Called the "Busy Bee", the Kinner model AB-3, is an air-cooled, 4-cycle, L-head engine rated 5 hp., at 2600 rpm., but develops 6 hp., at 3250 rpm. The single cylinder is horizontal and detachable, making maintenance easier. Bore is 2¾ in., stroke 3 in., displacement 17.8 cu. in. The whole unit requires only 2.4 cu. ft. of space. Aluminum alloy is used in crankcase, piston, head, and crankcase and rear

ROD BABBITTING

ANOTHER PLANT CONTROLLED OPERATING *in all* WISCONSIN *Air-Cooled* ENGINES

There's more to babbitting connecting rod bearings than simply applying the metal. Not only must the work be expertly done, but it is important that frequent detailed chemical analyses be made of materials in order to provide a dependable safeguard against inferior quality bearing metal, and to assure constant uniformity.

Wisconsin Engine connecting rod bearings are babbitted in our own plant, under our own complete control. A careful check is maintained to make sure that the metal is always what it *should* be and that it is applied *the way it should be*. This helps to make a better engine . . . designed to give better service on your equipment.

Most H.P. per pound

WISCONSIN MOTOR Corporation

MILWAUKEE 14, WISCONSIN, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines

with AUTOMATIC LEVELING, CONTROLLED COMPACTION and FINISHING TO SUIT MATERIAL

JAEGER BITUMINOUS PAVER

MODEL BP-2L

Lays smoother pavements by combining "long wheelbase" action with positive automatic screed leveling to grade of the laid surface, curb or header. High speed oscillating compactor wedge insures more uniform density. Tiltable screed varies the finish to suit the material—from light emulsions to densest sheet asphalt. Send for full details.

THE JAEGER MACHINE COMPANY

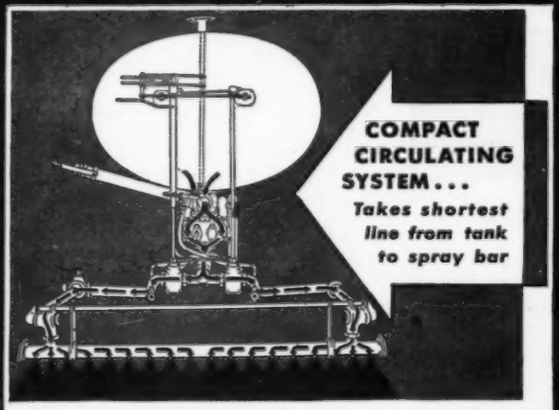
223 Dublin Avenue, Columbus 16, Ohio

World's Largest Builders of Road Spreading and Finishing Machines

ETNYRE

"Black-Topper"

BITUMINOUS DISTRIBUTORS



NO WASTE of heat or energy from long travel of hot or cold material. Leakproof . . . no pipe fittings. Service any part without disturbing remainder of system.

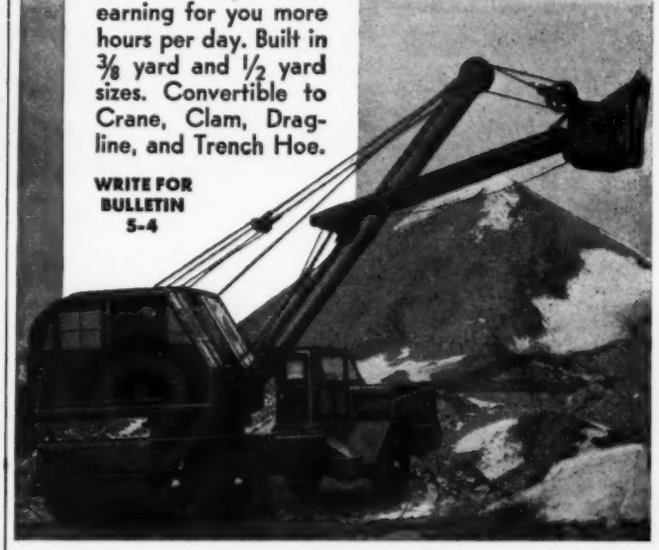
Less than 5 cubic feet required for entire circulating system, including pump. Handles all grades asphalt, tar, emulsion or road oil.

E. D. ETNYRE & CO., Oregon, Illinois

This SHOVEL Gets Around F-A-S-T!

With road speeds up to 30 miles per hour the Mobile Michigan is on the job and earning for you more hours per day. Built in ⅜ yard and ½ yard sizes. Convertible to Crane, Clam, Dragline, and Trench Hoe.

WRITE FOR BULLETIN 5-4



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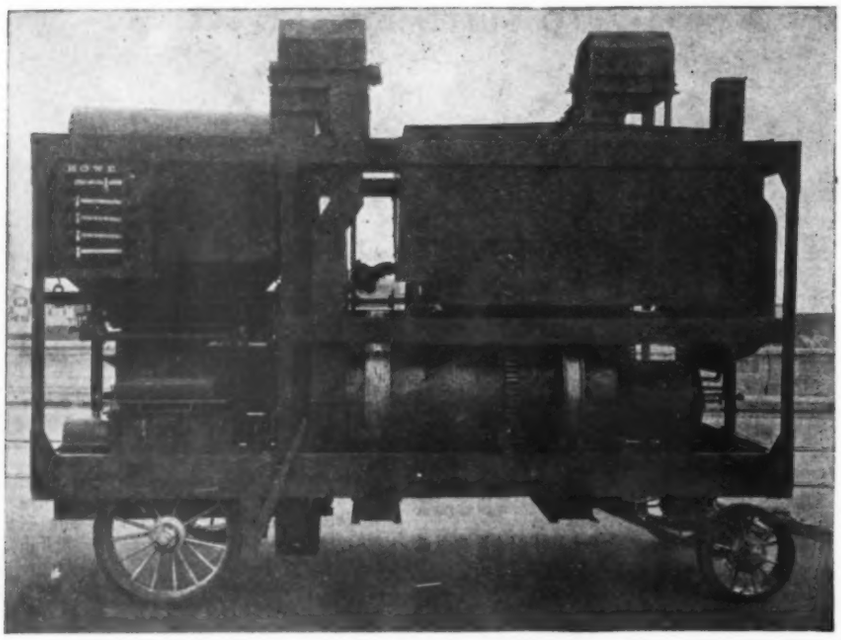
HERE IS A COMPLETE **ASPHALT PLANT!**



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FLUIDOMETER
Modernize your Asphalt Plant by installing a Fluidometer Automatic Metering System.

● This H & B Patch Plant meets every requirement for speedy, economical repair work. May be set up as a stationary plant on steel columns, or used as a mobile unit—wheel mounted as shown. Will efficiently produce material to meet any standard hot or cold mix specifications. Capacity, 3 to 5 tons per hour. Gasoline or electric power unit optional. Rugged, double-shaft pug mill mixer. Collapsible hoist. SKF bearings throughout. Portable units have rubber-tired wheels and a short turning radius—conforming to highway and street regulations.

Bulletin R-402, giving complete information and flow diagram, will be sent on request.

HETHERINGTON & BERNER INC.
721 KENTUCKY AVENUE • INDIANAPOLIS 7, IND.

H&B Hetherington & Berner
FOR BEST RESULTS . . . BATCH MIX — HOT MIX

cover. Power take-off shaft is 1 in. in diameter, and rotates counterclockwise facing the shaft.

▼

Hardenability Calculator

A new circular slide rule to be used in computing the approximate hardenability of steel from its chemical composition and grain size in accordance with standard formulae has been designed by the metallurgical engineers of the Steel and Tube Division of The Timken Roller Bearing Co., Canton 6, O. A free copy may be obtained by writing a request on your firm's letterhead.

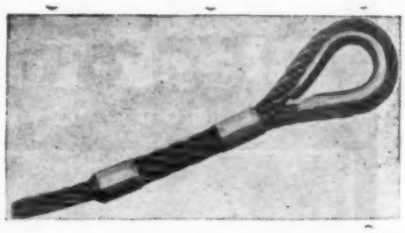
All-Green Wire Rope

Wire rope that is entirely covered with a green-colored lubricant has recently been announced by the American Chain & Cable Co., Bridgeport, Conn., for their two wire rope divisions, the American Cable Division and the Hazard Wire Rope Division. Only their highest grade rope (preformed of improved plow steel) will be so lubricated. Their non-preformed ropes made of improved plow steel will continue to be identified by a single green strand. American Chain & Cable has long identified its ropes made of improved plow steel with a single green-colored strand. Emerald-green having been adopted as the Acco color, American Chain & Cable established a formula for a superior lubricant colored green for use as its identifying strand. That this green lubricant was definitely superior to ordinary black lubricants is stated to have been proved by years of field service. Ropes having the green strand, retired from all manner of service and returned to the mill for inspection and testing, are said to have revealed that wires protected with the green lubricant were in far better condition than the wires under the black lubricant in adjacent strands. American Chain and Cable's "Green-Lube" has high viscosity and remarkable capacity for adhesion to the surfaces of the wires. It has a grease-like consistency at normal temperatures and is applied hot and in a molten state by the pressure method which not only assures complete coverage of every wire but the filling or "stuffing" of the voids between wires. Thus it better protects the wires, enables them to adjust themselves more easily, adheres to the wires longer and thereby develops longer rope wear.

▼

New Safety Splice

American Chain & Cable Co., Inc., Bridgeport, Conn., has announced the development of a new method for splicing wire rope into slings or various assemblies—a method which renders hand-tuck splicing obsolete and unnecessary. This method develops a neater and more compact splice than



Acco-Loc safety splice

is possible by the hand method. The splice is flexible clear to the terminal, and always develops 100 per cent of the rope's strength. The splice does not distort the rope structure and so maintains equalization of stresses in all strands. The splice applies the load stress in direct line with the pull of the load. It has no seizings to loosen, unravel or get in the way; no wire ends to barb and tear workmen's hands. It is wide open for visual inspection at all times. It may be used with any standard fitting (hook, ring, shackle, thimble, etc.), and when the sling or assembly is retired such fittings may be salvaged and re-used. At the present time the new Acco-Loc safety splice can be applied only at the factory.

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The C.I.T. Equipment Funding Plan provides the money with which to buy machinery and equipment *for cash.* Funds are available in any amount, any time, any place.

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Can Dig, Grade, Load and Backfill—Tremendous Crowd Plus Travel Speeds to 15 m.p.h.—Buckets and Other Attachments (Crane Boom, Blade, etc.) Quickly Changed to Suit the Work. Ask for Catalog JL-5.

½ and ¾ Yard Buckets

1 and 2 Yard Buckets

Dig, Grade, Backfill, Load, Move Cars

Handle Many Materials—from Earth to Snow

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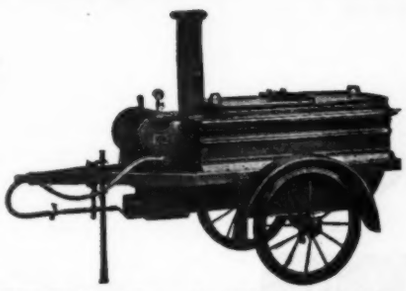
CONNERY'S HEATING KETTLE

For speedy heating of tar and asphalt—



Use this CONNERY oil-burning Patrol Patching Heater on the *small* job and this CONNERY oil-burning kettle for *large-quantity* production.

Write for catalog showing our full line of tar and asphalt heating kettles, spraying attachments, pouring sets, etc.

CONNERY CONSTRUCTION Co.
3900 North Second St. Philadelphia, Pa.

TIME'S GREATEST PROVING GROUND

The world-wide scope of World War II makes possible new and varied performance testing for construction equipment that is used by the Armed Forces and by war contractors.

The pressure under which Byers shovels and cranes are working on this greatest proving ground of all time probably comes more close to the ideal speed-up-life-test than any peacetime jobs could provide. Thus the experience gained during this period when Byers new models of excavators are not available for general distribution is helping Byers engineers develop these now shovels and cranes to a high degree of efficiency.

When they become available to you, you will be assured of thoroughly dependable, experienced Byers shovels and cranes in which every new and improved feature has a background of performance tests that qualify the entire machine for postwar work.

Modern CRANES and SHOVELS

BYERS

RAVENNA, OHIO

Light-footed

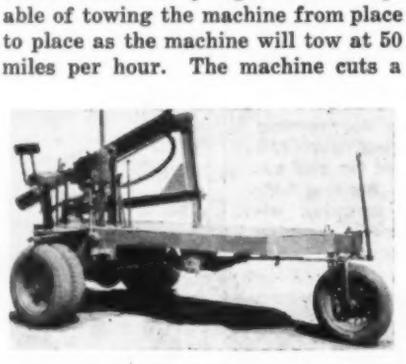
The Insley Excavator's crawler shoes are *extra* long and *extra* wide (at *no* extra cost) to provide better weight distribution and reduced ground pressure. That's why the Insley Excavator is "light on its feet" . . . fast and easy to handle in soft spots and tight spots alike.

You'll like these features of design and construction because—*like every Insley feature*—they contribute to lower cost yardage. For your new equipment—when we can again supply it—choose an Insley ⅜ or ½ yd. Excavator . . . available with five easily interchangeable attachments—shovel, crane, hoe, dragline and clamshell.

EXCAVATORS
INSLEY
CONCRETE EQUIPMENT
INSLEY MANUFACTURING CORP., INDIANAPOLIS 6, IND.

New Pavement Breaker

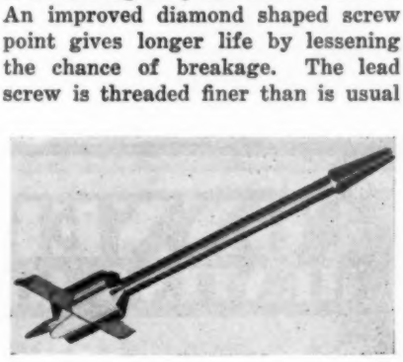
A new 3-wheel type pavement breaker machine, adaptable for breaking out small patches on highway work or any other small job, has been developed by the Rapid Pavement Breaker Co., 1517 Santa Fe Ave., Los Angeles, Calif. The machine illustrated herewith has the boom laid back on its axis and ready to be towed from one job to the other. When the boom is raised, it is held in place by a rear brace running from the pin at the top of the boom and fastened to the dock of the machine towards the front wheel. Any light car is capable of towing the machine from place to place as the machine will tow at 50 miles per hour. The machine cuts a width ranging from 6 in. to 5 feet. The machine is entirely controlled from the operator's seat, and by running a hose from the compressor to the supply line of the machine, it is ready to operate. The swing and the blow and the propelling of the machine is pneumatically operated with all controls within easy reach of the operator. It requires one man to operate it. The manufacturers of this machine are also the manufacturers of the heavy duty type machine that has been in the field for the past 18 years.



New Pavement Breaker

New Wood Boring Tool

An expansive bit, stated to be designed on an entirely new principle, and created specifically for use in hand braces to cut holes in wood, has been announced by Bruno Tools, 9330 Santa Monica Blvd., Beverly Hills, Calif. In this bit the center lip which cuts away the core at the center of the hole extends back to form a clamp which firmly holds the adjustable blade at the diameter set. The clamp is locked tight by means of a screw. An improved diamond shaped screw point gives longer life by lessening the chance of breakage. The lead screw is threaded finer than is usual for this type of tool, the bits are equipped with two cutting blades—long and short—required to cover the range of the tool. A graduated scale on the blade makes adjustment easy. This is in addition to the fixed cutter or center lip which cuts away the material at the center around the screw point. Another important innovation in this new expansive bit, according to the manufacturers, is the removable center lip or cutter, which also serves as a clamp to hold the blade. This makes possible the easy replacement of all parts. The bits are equipped with blades forged from highest grade of carbon tool steel for efficient boring in hard or soft wood. Blades are easily sharpened in the conventional way, or replaced. Two models are available. No. 200-B cuts holes from ¾ in. to 1¾ in. It is 7 in. long. No. 201-B cuts all diameters from 1½ in. to 3½ in. and is 8½ in. long. Both tools are equipped with standard square bit stock shank.



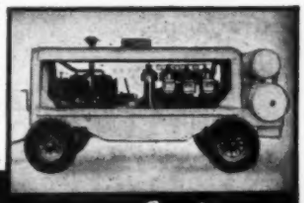
New Expansive Bit

RUGGED AS A PIONEER

THE DAVEY PORTABLE COMPRESSOR

Davey pioneered with these "firsts" in portable compressor manufacture: air-cooled design . . . aluminum alloy cylinder heads . . . carbon-free stainless steel valves . . . one-piece welded steel frame . . . automotive type steering. Today, Davey is the only compressor offering all these "firsts" along with guaranteed-for-life valves.

There's a Davey Air Aristocrat compressor for every purpose . . . rugged . . . operating at conservative speeds . . . to insure longer, constant service, at lower ultimate cost.

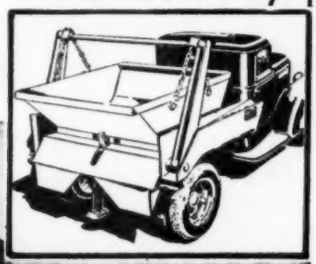


GET THE COMPLETE STORY by writing for your free copy of Davey Catalog E-172, giving full information on Davey Compressors, Heavy-Duty Truck Power Take-Offs and Pneumatic Saws.

9-345-B

DAVEY *Compressor Co.*
KENT, OHIO
DEALERS IN PRINCIPAL CITIES

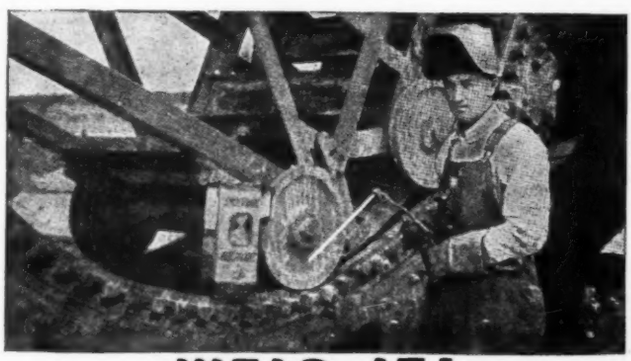
Brooks LOAD LUGGER —For Economy!



Cities and counties can use these two types of the LOAD LUGGER with a big saving in time, manpower and equipment costs. Regular open-type dump bucket shown at top and enclosed type refuse container below. Spotted at convenient points for loading, containers can be filled and picked up for hauling and dumping. *Write for Bulletin.*

505 Davenport Road, Knoxville 8, Tenn.
Distributors in All Principal Cities

Brooks EQUIPMENT & MFG. CO.
KNOXVILLE, TENNESSEE



WELD IT!

SAVE TIME, MONEY, MACHINERY

Avoid costly lay ups . . . of waiting days for replacement parts — repair-weld your machinery right on the job! Arc welding is the quick, easy way of making repairs . . . of maintaining equipment — at lowest cost.

No matter what you have to weld — there's a P&H Welding Electrode suited exactly for the purpose. The complete P&H line includes types and sizes for all repair and maintenance-welding requirements . . . to provide unusual resistance to wear, abrasion and impact.

There's a P&H field man ready to help you with your welding problems. Call your nearest P&H representative — or write for folder giving complete line.

General *Offices:* 4496 West National Avenue, Milwaukee 14, Wis.

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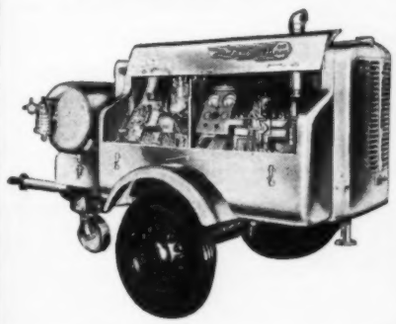
WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

AIR PLUS JAEGER COMPRESSOR



60 to 500 ft. sizes
•
75% to 100% larger valve area
•
20% slower piston speeds
•
100% efficient intercooling
•
50% larger air receivers

YEARS AHEAD — in Compressor Design and Performance

Built to aircraft engine standards of precision in a balanced design that operates without vibration, the big-valved, force-feed-lubricated Jaeger "AIR PLUS" offers you a notably smoother, cooler running compressor that sets new standards for fuel economy and low upkeep cost. Sold and serviced by Jaeger distributors in over 100 cities, coast to coast.

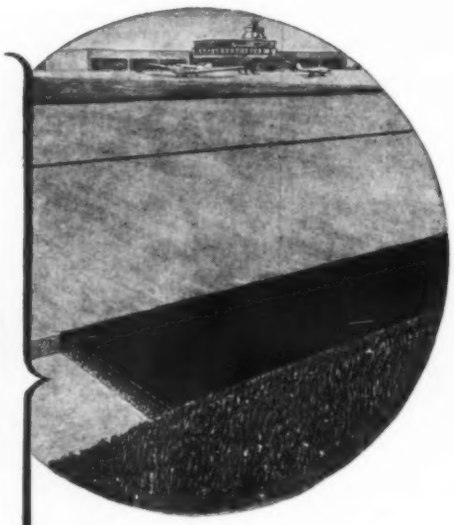
Ask for your copy of this new catalog showing trailer, truck, tractor and skid-mounted models with gas, diesel and electric power.

THE JAEGER MACHINE CO.
223 Dublin Ave., Columbus 16, Ohio

PUMPS • MIXERS • PAVING MACHINERY • HOISTS • LOADERS

Bituvia Marginal Protection

for Airport and Highway Pavements



● Both flexible and rigid pavements are vulnerable to failure at the edges. A BITUVIA surface treatment will protect the edges of airport runways and highways from moisture, insuring long service and low maintenance costs.

BITUVIA Road Tar

Handy pocket-size Bituvia manual will be sent on request.

OTHER BITUVIA APPLICATIONS

BITUVIA ROAD MIX
For economical mixed-in-place construction.

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For spot patching and preparation of stock pile patching mixtures.

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For waterproofing cracks and giving new, skid-resistant surface.

BITUVIA HOT PLANT MIX
For airport runway base and wearing course.

REILLY TAR & CHEMICAL CORPORATION
Executive Offices: Merchants Bank Building, Indianapolis, Indiana
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SEVENTEEN · PLANTS · TO · SERVE · YOU

Obituaries

ANTHONY L. ANRADOU, 81, for 30 years an engineer in the city engineer's department of San Francisco, Calif., died April 15. He had been retired for the past 10 years.

▼

STEPHEN W. KELLY, 56, construction engineer for McElwee & Rogy, paving contractors, died April 22 in Peoria, Ill.

OSCAR W. LANGENDORF, 56, for 20 years county engineer of Sutter County, Calif., died April 13, in Yuba City, Calif. At the time of his death he was chief civilian post engineer at Camp Beale.

▼

GILBERT J. BELL, 89, retired civil engineer, died April 29 in Chicago. He was employed for more than 45 years by the Santa Fe Ry. before his retirement 8 years ago. He was a specialist in river control work and bridge construction.

ANDREW P. HARTMAN, 76, formerly city engineer of Yonkers, N. Y., died April 18, in Tuckahoe, N. Y. He was an engineer on surveys for the extension of Riverside Drive, New York City, 38 years ago.

▼

JAMES J. RYAN, 78, for 21 years city engineer of Muscatine, Ia., and county engineer of Muscatine county for one year, died recently in Muscatine. He was engaged in the contracting business for many years.

▼

CHARLES B. WEAVER, 54, highway contractor of Anoka, Minn., died last month in Jackson, Miss., where he had recently completed the construction of an airport. His firm handled many road grading contracts in Minnesota.

▼

Arthur Underhill, 62, road contractor of Motley, Minn., died recently in a hospital at Staples, Minn.

With the Manufacturers and Distributors

Buffalo-Springfield to Expand

According to a statement by Carl F. Greiner, president of Buffalo-Springfield Roller Co., Springfield, O., the company's production will be increased 60 per cent at the "urgent request of the U. S. Army Engineer Corps." The War Manpower Commission and War Production Board have given the green light for immediate increase in plant personnel and installation of high production machine tools to enable the company to supply more rollers for critical airport and road construction and maintenance.

▼

New Director National Highway Users Conference

Arthur C. Butler, who has been appointed director of the National Highway Users Conference, has a wide experience in the motor transport field for the past 15 years. He had been manager of the Motor Truck Division since 1932. When the war came he was assigned to head the Military Vehicles Division of the Automotive Council for War Production. P. D. McLean, who has been acting director of the Conference since the resignation of Chester H. Gray last fall, has been appointed assistant director.

TOUGH GOING but OWEN BUCKETS Finish the JOB

A MOUTHFUL AT EVERY BITE

The OWEN BUCKET Co.
6070 Breakwater Avenue, Cleveland, Ohio
Branches: New York Philadelphia Chicago Berkeley, Cal.

UNIT

NEW FULL VISION CAB

mobile CRANE

SELF-PROPELLED

5 to 7 TON

Write for particulars

Powerful, fast-stepping Mobile Crane . . . one-man operated . . . for "on and off" highway operations . . . simple to operate . . . (eliminates cut-up terrain, mottled concrete decks and runways.)

UNIT CRANE & SHOVEL CORP. MILWAUKEE 14 WISCONSIN

Concrete

VIBRATORS and GRINDERS

Write for Circular on types, sizes and Prices

ELKHART White Mfg. Co. INDIANA

LOW COST LOADER HANDLES BIG JOBS!

SCHINCK

Automatic TRACTOR LOADER

Fits 22 leading makes and models of ROW-TYPE TRACTORS

LOADS SAND, EARTH, GRAVEL, AGGREGATES, DIGS, SCRAPES, GRADES, LEVELS, LIFTS, PULLS . . . BUILT FOR HEAVY DUTY SERVICE

If you have ROW-TYPE tractors, you need an Automatic Loader on every job location. This sturdy, low cost loader does the work of 10 men! Attaches easily and quickly to most any row-type tractor. Patented *Perfection* dump control and 8-foot lift gives operator constant control. All steel construction with heavy boom. . . . Positive action. . . . Simplified operation from power take-off. . . . Has ½-yd. bucket. . . . Fast . . . Built to last for years! No other loader near its price offers so many advantages!

Write today for free descriptive folder and the name of your local dealer.

Automatic EQUIPMENT MFG. CO.

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ARMY E NAVY

ROGERS TRAILERS

ARE AGAIN AVAILABLE

IMPROVED methods and expanding facilities have increased our production to a point that meets continuing military demands and enables us to supply a limited number of trailers for commercial use.

If you are one of the many contractors or riggers who have wanted Rogers Trailers, we will be happy to go into the matter with you.

If our catalog will be of interest, we'll be glad to send it to you.

ROGERS BROTHERS CORP. ALBION, PENNA.

EXPERIENCE builds 'em ROGERS LOW BED Heavy Duty TRAILERS PERFORMANCE sells 'em

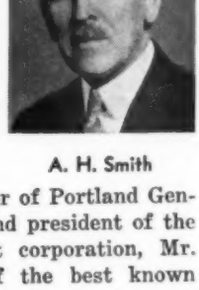
MARION BODIES ARE BUILT TO "TAKE IT"

They can stand up under all the punishment handed out in the highway construction field and come back for more . . . month after month, year after year. They have built-in toughness without extra weight . . . scientific construction which incorporates newest developments in efficiency and durability.

MARION makes a complete line of standard equipment, while MARION engineers are always available to design special bodies to meet your exclusive requirements.

See Your Local Distributor or Write
THE
MARION METAL PRODUCTS CO.
BODY and HOIST DIVISION, MARION, O.

Hyster Co. Chairman Dies



A. H. Smith

Amedee H. Smith, 76, pioneer west coast industrialist, died March 25 in Portland, Ore. Chairman of the board of directors of Hyster Company; president of the Willamette Iron & Steel Co.; a director of Portland General Electric Co. and president of the Oregon Paramount corporation, Mr. Smith was one of the best known business leaders of the west coast. At various intervals he was president of the Oregon Terminals, Inc.; president, Masonic Temple association; president of the board of trustees of Willamette university; vice president, Ochoco Timber Co.; director, Ochoco Lumber Co.; and president, Portland Chamber of Commerce.

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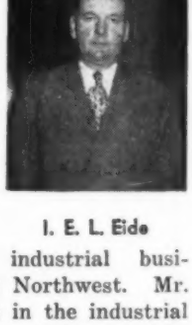
Ivan E. L. Eide Joins Oliver "Cletrac" Organization



I. E. L. Eide

W. E. Miles, Industrial Sales Manager of The Oliver Corporation at Cleveland, O., has announced the appointment of Ivan E. L. Eide as district manager in charge of Oliver "Cletrac" industrial business in the Pacific Northwest. Mr. Eide is well known in the industrial field with 20 years' experience in the construction and automotive industries as district representative for J. D. Adams Co.; in Charge of Industrial Equipment at Billings, Mont., for Allis-Chalmers; district representative for Galion Iron Works and zone manager for Ford Motor Co.

▼

New Hyster Factory Representatives

Newly appointed factory representative for the Hyster Co., Portland, Ore. and Peoria, Ill., is James A. Roach who will cover the Atlantic seaboard states with headquarters at the Hyster New York office, 90 West St. Roach recently joined Hyster after several years with Mercury Manufacturing Co. in Chicago Paul Lightbody, fomerly with Caterpillar Tractor Co., has been appointed Memphis manager for the Hyster Co. His office is at 211 Farnsworth Bldg., Memphis.

J. Aprea New Advertising Director for Eutectic

The Eutectic Welding Alloys Co. has announced the appointment of John Paul Aprea as advertising and public relations director. This appointment is in line with the company's plan for the post-war expansion of its advertising facilities. Mr. Aprea, was recently discharged from the armed forces. He has served as advertising and sales promotion manager for the National Manufacturing Corp., Tonowanda, N. Y., and as an executive in the advertising department of the Ruberoid Co., New York.

Koehring Export Manager Visits Latin America

William J. Reagan, export manager of Koehring Co., Milwaukee, Wis., has returned from a survey tour of Latin America. Mr. Reagan, accompanied by T. J. Bachhuber of the Koehring sales organization, visited Canal Zone, Colombia, Ecuador, Peru, Bolivia, Chile, Argentina, Uruguay, Paraguay, Brazil, Trinidad, Venezuela, Jamaica and Cuba. Mr. Reagan, who joined Koehring last year, has had 25 years experience in the export business.

Athey Names Lease President

B. F. Lease has been elected president of Athey Truss Wheel Co., Chicago, Ill. Mr. Lease, who, since July, 1944, has been vice-president in charge of sales, advertising and service, succeeds the late C. Kier Davis, killed in an automobile accident in March. "Ben" Lease started with Athey in 1931 as special representative, and from there he advanced rapidly to district representative; manager, service and research; manager, domestic sales; vice-president in charge of sales, advertising and service. Prior to joining the Athey organization, he served for many years with the Republic Truck Co. and Lynn Manufacturing Co.

B. F. Lease

▼

Alfred Kauffmann Elected Director Gardner-Denver

Alfred Kauffmann, retired president of Link Belt Co., has been elected a director of the Gardner-Denver Co. He succeeds P. H. Gardner, who resigned his directorship because of ill health. Mr. Kauffmann, who is well known in business and industry, joined the Link Belt Co. in 1901 immediately after his graduation from Pratt Institute in Brooklyn. In 1924 he was elected president of the company with headquarters in Chicago. He retired in 1943, but remains a member of the board of directors. Mr. Kauffmann is also a member of the board of the La Plant Choate Mfg. Co., Cedar Rapids, Ia., and of the Cardox Co., Chicago.

Alfred Kauffmann

▼

Wickwire Spencer Appoints Bekaert Comptroller

E. P. Holder, President, has announced the appointment of A. C. Bekaert as comptroller of the Wickwire Spencer Steel Co. and subsidiaries. Mr. Bekaert has been associated with Wickwire Spencer since 1943 as assistant treasurer. In his new position Mr. Bekaert will act as comptroller for Wickwire Spencer's subsidiaries, the American Wire Fabrics Corporation, Wickwire Spencer Metallurgical Corporation, and the Wickwire Spencer Aviation Corporation, as well as for the parent company.

Seven New Distributors for Lima

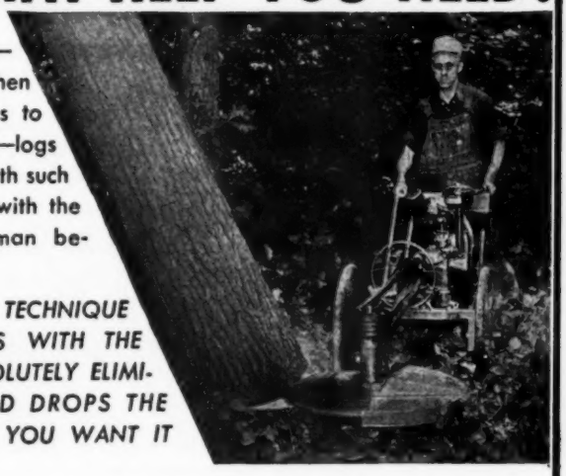
Lima Locomotive Works, Inc., Lima, O., has announced the appointment of seven new distributors for Lima shovels, draglines and cranes: McLean-Sims Machinery Co., W. Madison St., Palatka, Fla. Territory: State of Northern Florida; State Machinery & Supply Co., 2204 Main St., Columbia 1, S. C. Territory: State of South Carolina; G. C. Phillips Tractor Co., 1909½ First Ave., No., Birmingham, Ala. Territory: State of Alabama and Western Florida; Martin Machinery and Supply Co., 700 Dale Ave., (P. O. Box 1787) Knoxville 1, Tenn. Territory: Central and Eastern Tennessee.

Modern Machinery Co., Inc., North 2417 Division St., Spokane 2, Wash. Territory: State of Eastern Washington, Northern Idaho and Extreme Western Montana.; West Virginia Mine Supply Co., Box 872, Clarksburg, W. Va. Territory: State of Northeastern West Virginia; Chicago Construction Equipment Co., 13912 South Halsted St., Chicago 27, Ill. Territory: Northern Illinois and extreme Northwestern Indiana.

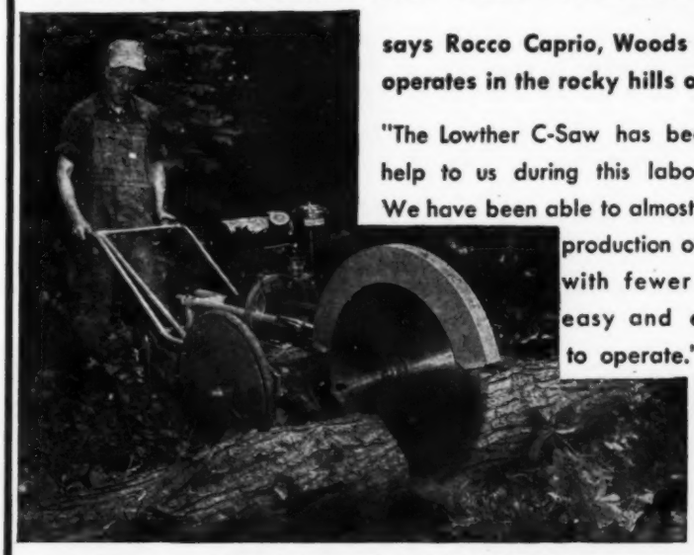
HERE'S THAT HELP YOU NEED!

Production is increased—with less man power—when the Lowther C-Saw goes to work! Trees are felled—logs bucked and limbs cut with such ease and speed that with the Lowther C-Saw—one man becomes a crew!

THE NEW "C-SAW" TECHNIQUE USED IN FELLING TREES WITH THE LOWTHER C-SAW ABSOLUTELY ELIMINATES PINCHING AND DROPS THE TREE EXACTLY WHERE YOU WANT IT



"ALMOST DOUBLES OUR PULP PRODUCTION"—



says Rocco Caprio, Woods Boss, who operates in the rocky hills of Penn.

"The Lowther C-Saw has been a great help to us during this labor shortage. We have been able to almost double our production of pulpwood with fewer men. It is easy and economical to operate."

HARRY A. LOWTHER COMPANY

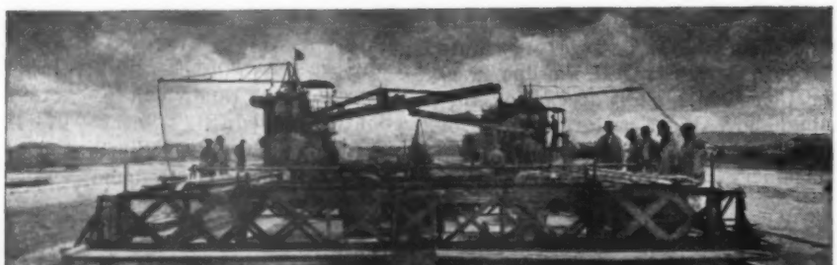
141 WEST JACKSON BOULEVARD · CHICAGO 4, ILLINOIS

I need help. Tell me how the Lowther C-Saw can replace lost man power. Send me circular 86.

Name.....

Address.....

Here's Why Road Men Prefer 'FLEX-PLANE' Dummy Joints



Good Timing

With a high speed "FLEX-PLANE" joint installing machine dummy joints are put in at "just the right time"—every time—for best results...no waiting...no delays.

Uniformity

There is consistent uniformity of joints...good alignment and same depth whether you install one or a hundred joints.

Always Ready

When the concrete is ready, the machine is ready . . . this relieves the contractor of constant supervision.

Speeds the Job

"FLEX-PLANE" joint installers permit close spacing of transverse joints—it never gets behind.

Better Joints—Better Roads—Seldom Any Maintenance

Low spots along the joints are eliminated when a "FLEX-PLANE" machine is used to cut the groove—thus eliminating filling in with excess matrix or dry materials.

Write for details on the "FLEX-PLANE" Joint Installer

FLEXIBLE ROAD JOINT MACHINE CO.
WARREN, OHIO

VULCAN

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan illustrated CATALOG today.

VULCAN TOOL MFG. CO.
QUINCY MASS

RELIANCE

CRUSHING, SCREENING and WASHING UNITS

● Up to 2000 Tons a Day ●

Crushers, Elevators, Sweepers, Screens, Wash Boxes, Bins, Pulverizers, Feeders, Spreaders, Kettles, Conveyors, Drag-Lines "GAYCO" Centrifugal Air Separators

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.

Canadian Representatives: F. H. Hopkins & Co., Ltd. 160 Canada Cement Co., Montreal, Que., Can.

Marion Appoints New President

M. E. Montrose

At the annual meeting of directors of The Marion Steam Shovel Co., Marion, O., Maynard E. Montrose was elected president and general manager. Mr. Montrose, a 42 year old executive from Los Angeles, Calif., brings to the company a broad industrial experience. In 1922, he joined the General Electric Co. and was employed by it in various capacities until 1935 when he became associated with the Lane-Wells Co., Los Angeles. Since that time he has served the company in important managerial positions and was executive vice-president until his recent resignation. In addition to Mr. Montrose as president and general manager, the board of directors elected J. M. Strelitz, Marion, O., as chairman of the board and general counsel, Alec Gibson as vice-president and treasurer, John P. Courtright, vice-president in charge of sales, Harvey T. Gracely, vice-president, and M. Virden, sec'y and asst. treas.

▼

Harry Bernard New Service Director for Mack

Harry Bernard has been appointed director of service and service engineering for Mack Trucks, Inc. He will be responsible for overall policy and management control of both organizations. Mr. Bernard joined Mack in 1924 and prior to his present appointment had been general service manager. He will make his headquarters in Mack's Long Island City plant.

▼

J. C. Rowold New Mack West Coast Manager

J. C. Rowold, vice president of Mack-International Motor Truck Corp., has been appointed manager of Mack's Pacific Coast Division. He replaces J. A. Stoner who has retired after 28 years of active service with the Mack organization. Mr. Rowold joined the General Sales Department of Mack in 1917 and within 10 years had worked his way up through a variety of sales positions to the post of district manager in the Mack Southern Division. Seven years later he was named manager of the entire Southern Division and elected vice president of the company. He remained manager of the division until his present appointment to the Pacific Coast. He will make his headquarters at 1501 South Central Ave. in Los Angeles.

J. P. Roberts Promoted by Timken

John P. Roberts, manager of the Minneapolis District Office of The Timken Roller Bearing Co., Canton, O., has been named as assistant general manager of the Sales and Service Division with headquarters at Canton. Mr. Roberts was Pittsburgh Sales Representative from 1935 to 1940, when he was made manager of the Minneapolis branch. J. F. Cornell, who was doing sales promotion at Canton, O., has been named manager of the Service and Sales Division of the Seattle (Wash.) District Office C. D. Davis, manager of the Service and Sales Division of the Seattle branch, has been named manager of the same division for the Chicago District Office. K. K. Cook, sales representative in Minneapolis has been named manager of the Minneapolis branch.

▼

T. V. Buckwalter of Timken Retires

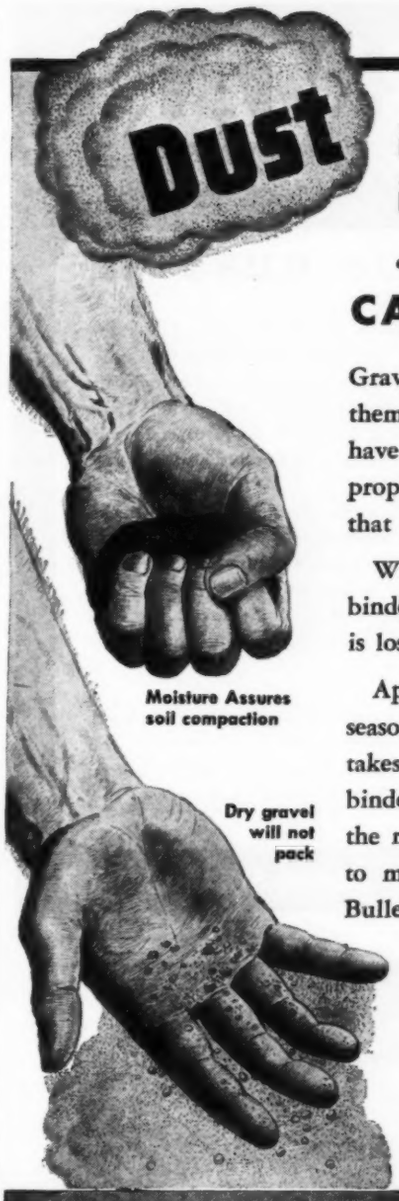
T. V. Buckwalter

Tracy V. Buckwalter, for the past 25 years, chief engineer and vice president of the Timken Roller Bearing Co., Canton, Ill., has retired under the company's retirement annuity plan. The company will retain his services in a consulting capacity. Mr. Buckwalter came with the Timken Co. in 1916 as chief engineer after 16 years with the Pennsylvania RR in their shops in Altoona, Penn., where among other things he developed the motor baggage truck, which truck carried his name and from which idea resulted most of the motor-driven baggage trucks used by railroads in both this country and abroad. For many years his work with the Timken Co. as chief engineer embodied engineering and development in the automotive and general industrial fields.

▼

New Distributors for Littleford

Littleford Bros., Inc., Cincinnati, O., have added to their list of distributors the following companies: Edward R. Bacon Co., 2101 Folsom St., San Francisco, 10, Calif.; Carroll-Edwards & Co., Richmond & McLean Sts., Cincinnati, O.; Hardin and Coggins, 1717 N. Second St., Albuquerque, N. M.; Milton-Hale Machinery Co., 1024 North Broadway, Albany, N. Y.; State Equipment Co., P. O. Box 668, Harrisburg, Pa.; Gibbs-Cook Tractor &



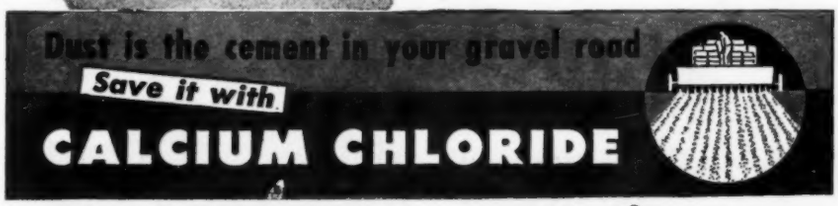
Dust is the CEMENT in your gravel roads . . . save it with CALCIUM CHLORIDE

Gravel roads need binder soil to hold them together—and binder soil must have moisture to give it cementing properties. Calcium chloride provides that long-lasting moisture bond.

When roads become dusty, the fine binder soil blows away. As binder soil is lost, road serviceability goes with it.

Apply calcium chloride early in the season so that moisture compaction takes place before dust carries the binder soil away. It is easier to save the road than resurface it . . . cheaper to maintain than rebuild it. Get our Bulletin 29 on Low Cost Roads.

CALCIUM CHLORIDE ASSOCIATION
4145 Penobscot Bldg., Detroit 26, Mich.



South Bend
GUTTER-SNIPE
PICK-UP STREET SWEEPERS
•
STREET FLUSHERS
STREET SPRINKLERS
BITUMINOUS DISTRIBUTORS
BITUMINOUS MAINTENANCE UNITS
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Since 1908
MUNICIPAL SUPPLY COMPANY - SOUTH BEND 23, INDIANA

PORTABLE ASPHALT PLANTS
High Production—Low Cost

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SAUERMAN
Long Range Machines

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MAJOR savings result when Sauerman Power Scrapers and Slackline Cableways are used in sand and gravel excavation, stockpiling and other material-handling jobs where the long operating range of these machines can be employed to advantage.

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BUILD *Better*
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WILLIAMS WALLACE COMPANY
100 Hooper St., San Francisco, California

Equipment Co., 1314 Walnut St., Des Moines, 9, Ia.; Indiana Equipment Co., Inc., 327 W. Market St., Indianapolis, 4, Ind.; Miller G. Williams Machinery Co., Foot of Coosa St., Montgomery, Ala.; Noble-Belisle Machinery, Inc., P. O. Box 391, White River Junction, Vt.; Wolverine Tractor & Equipment Co., 35 E. 7 Mile Road, Detroit, 3, Mich.; Tractor & Equipment Co., Sidney, Mont. These distributors will handle the complete line of Littleford black top road maintenance and construction equipment.

▼

John J. Bergen Chairman Board Gar Wood Industries

John J. Bergen

Commander John J. Bergen, USNR (Inactive), chairman of the executive committee of Gar Wood Industries, Inc., Detroit, Mich., has also been elected chairman of the board of directors. Commander Bergen was in addition named chairman of St. Paul Hydraulic Hoist Co., a subsidiary. Commander Bergen, who is president of the investment banking firm of John J. Bergen & Co., Ltd., New York, is also chairman of the executive committee of United Aircraft Products, Inc. and a director of Blair & Co.

▼

New Distributors for Koehring

The distributor organization of the Koehring Co., Milwaukee, Wis., has been strengthened by the appointments of new dealers in major construction areas. Just announced by J. F. Robbins, new Koehring sales manager who was recently moved up from a position as vice-president and sales manager of the C. S. Johnson Co., Champaign, Ill., were the appointments of four new Western distributors: Western Machinery, Spokane; Columbia Equipment, Portland and Boise; Moore Equipment, Stockton; Harron, Rickard and McCone, Los Angeles. Eleven Koehring sales and service centers, including a parts warehouse at Sacramento, now cover the Western construction area. Other new Koehring distributors are Allied Construction Equipment, St. Louis; Atlantic Tug and Equipment, Syracuse; Florida Equipment, Jacksonville, Miami and Tampa; Frantz Equipment, Philadelphia. Factory representatives have been assigned to service each construction area. F. S. Ray covers the Southern states; L. H. Belling the Southwest; J. L. Lamley the Northwest and R. E. Bansemer the Middle West.

New Briggs Distributor for Florida

The Briggs Clarifier Company, Washington, D. C., Manufacturer of industrial, marine and automotive oil filtration equipment has announced the appointment of Mack Sales, 425 East Platt St., Tampa, Fla., as distributor for the State of Florida.

C. F. Oechsle to Handle Ransome's Sales

C. F. Oechsle

Carl F. Oechsle has been appointed vice-president in charge of sales of Ransome Machinery Co. of Dunellen, N. J., a subsidiary of Worthington Pump and Machinery Corporation. The sale of Ransome's line of contractors' mixers and pavers will now be handled through Worthington's Construction Equipment department, of which Mr. Oechsle is manager. Headquarters of this sales department still remains in Holyoke, Mass., with regional offices in New York, Washington, Cleveland, Chicago and San Francisco.

New Distributors for Etnyre

Several new dealer appointments and changes have recently been made by E. D. Etnyre & Co., Oregon, Ill., manufacturers of bituminous distributors and street flushers. A new office has just been opened in Washington 5, D. C., at 1018 Vermont St., N. W., under the direction of Charles T. Hvass, Vice-President, for the handling of governmental contracts, export business and eastern sales. For the duration of the war Etnyre's New England office, under George E. Pearson, Vice-President and Eastern Sales Mgr., will have haedquarters in Boston office of Hedge and Mattheis Co., who handle Etnyre equipment in several offices throughout New England. Aldridge Equipment Co., 916 South State St., Jackson, Miss., will handle sales of Etnyre bituminous distributors and street flushers. The Michigan Tractor and Machinery Co. has opened a branch office in Traverse City, Mich., and will act as dealer for Etnyre equipment here as well as in Detroit and Grand Rapids. E. D. Etnyre & Co. has recently completed arrangements for dealer representatives: in Nova Scotia, Coleman Machinery Co., Ltd., Halifax; in Ontario, Geo. W. Crothers, Ltd., Leaside, Toronto; in Quebec, Laurion Equipment Co., Ltd., Montreal; and in Saskatchewan, R. J. Fyfe Equipment Co., Ltd., Regina.

Bigger payloads unloaded faster—less maintenance—greater profits—these are the advantages of Hercules construction . . . advantages that make Hercules dump bodies worth waiting for!

While you're waiting, your Hercules distributor can be of service, keeping your present equipment in top working order. He has the mechanical facilities, the replacement parts and the trained personnel needed to maintain your overworked equipment.

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SPLIT SHAFT POWER TAKE-OFFS • COAL CONVEYORS

Buy War Bonds — Invest in America s Future and Your Own.

HERCULES STEEL PRODUCTS COMPANY . . . GALION, OHIO

New Mack Appointments

C. F. Larsen has been appointed service manager of the General Service Department of Mack Trucks, Inc. Mr. Larsen joined Mack in 1920 as a flat rate clerk, and prior to his present appointment he had been in charge of the firm's parts pricing department. Other recent appointments are: S. H. Bridges has been named manager of Mack's Poughkeepsie, N. Y., Branch, replacing H. L. Weatherwax who resigned. Mr. Bridges started with Mack in 1936 as a salesman at the Albany, N. Y., Branch and before assuming his Poughkeepsie position had been manager of the Utica, N. Y., Branch. The new manager of the Utica Branch is G. L. Murphy, who joined the Mack organization in 1923. Prior to his present appointment he had been office manager in the Utica Branch. R. J. Meinert has returned to Mack as manager of national account sales in the Central Division with headquarters in Chicago, following a two years' leave of absence. During the two years, Mr. Meinert who started with the company in 1923 as a stock clerk in St. Louis, had served as an assistant automotive advisor with the Sixth Armored force at Camp Chaffee, Ark.

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● 19—6,000 gal., 8,000 gal., and 10,000 gal. capacity heavy R.R. car tanks with heating coils.

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1—Ord Finishing Machine—20'-22'
1—Ord Finishing Machine—10'
1—42" Austin Elevating Grader with Power Take-Off
1—Adams 12 ft. Leaning Wheel Blade Grader
1—Austin Hydraulic 12-Yd. Scraper
1—80 H. P. Cletrac (Crawler)—Gas
1—24 ft. House Trailer

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One (1) Fairfield Model 608 trough type Conveyor, 35' long, 24" wide rubber belt, mounted on two size 48"x4" wide steel spoke wheels, powered with Wisconsin Model "AHH" single cylinder 7½ H.P. air cooled engine. Rebuilt and guaranteed $1150.00

Two (2) Fairfield Conveyors—25' long, equipped with 21" wide wood block belt, mounted on two size 48"x4" wide steel spoke wheels. Wisconsin 7½ H.P. air cooled engines. Rebuilt and guaranteed .....$875.00 each

H. O. Penn Machinery Co., Inc.
140th St. and East River
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For Sale

Cold Asphalt Mixing Plants, portable.
3⅛ C. F. Concrete Mixer on wheels.
Concrete Vibrators.
Concrete Block Machinery.
200-amp. Welders, electric and gasoline.
Oil-burning Salamanders and Water Heaters.
Roofers, Kettles and Torches.
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1. 34E. Foote Paver.
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H. O. Penn Machinery Co., Inc.
140th St. and East River
New York 54, N. Y.

Manufacturers' Literature

Trucks—A new 32-page booklet, "Euclid Trucks in Mines and Quarries," just issued by The Euclid Road Machinery Co., Cleveland 17, O., headlights typical applications of rear-dump and bottom-dump Euclids in open pit mining and in quarries. Illustrations of 16 mine and quarry operations are included. Copies of the booklet are available for users of off-the-highway equipment for moving earth, iron ore, rock or coal.

▼

Paving Treatment—Fourteen types of paving treatment are described in a new 16-page brochure, "Surfacing With Tarmac," just issued by Koppers Co., Inc., Tar and Chemical Division, Pittsburgh 19, Pa. Advantages of each type of treatment are discussed together with methods of application and tables showing Tarmac and standard road tar designations, applications, temperatures and uses as well as recommended aggregate gradation.

▼

Protective Coatings—A new booklet published by Reilly Tar & Chemical Corporation, Merchants Bank Building, Indianapolis, Ind., describes and shows typical applications of Reilly protective coatings for metal, brick, cement and wood surfaces. It also describes creocote paint for creosoted wood block floors, poles, guard rails and posts and lists many of our other products. Copy of booklet will be sent on request.

▼

Steel Forms—Practical suggestions for the economical adaptation of steel forms are contained in Bulletin 2035 of the Blaw-Knox Co., Blawnox, Pa. These are frank discussions of when and where steel forms should be used. Drawings show the preferable location of construction joints, the adjustability of steel forms, a study of the curves generally found in the construction of tunnels of various types, and how they can best be made by the use of steel forms. Copies of the bulletin may be obtained by writing Blaw-Knox Co. at the above address.

New Books

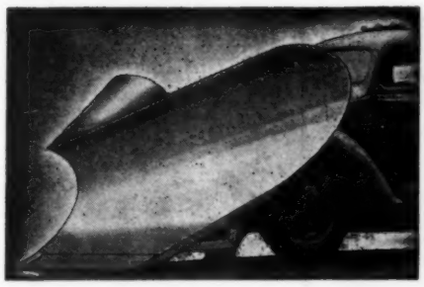
ELEMENTARY SURVEYING. By Charles B. Breed and George L. Hosmer; 717 pp.: $4; John L. Wiley & Sons., Inc., New York.

This is the 8th edition of this well-known text book from which thousands of embryo engineers have obtained their first knowledge of the tools of their profession. Several revisions have been made from the previous edition. The text on Public Land Surveys has been completely rewritten to conform to present practice. The isozenic chart in Chapter II and astronomical tables and illustrative problems in Chapter VIII have been brought up to date. The text on leveling rods in Chapter IV has been revised and new illustrations added.

▼

ASPHALTS AND ALLIED SUBSTANCES. By Herbert Abraham; 2 vol. 2142 pp; $20; D. Van Nostrand Co., Inc., New York.

The first edition of this monumental work dealing with the fabrication merchandising and application of bituminous products appeared in 1918. This, the 5th edition, has been revised and brought up-to-date as regards technological developments, methods of testing, bibliography, embracing more than 1,300 treatises, and references which total more than 20,000 including about 12,000 U. S. and foreign patents.



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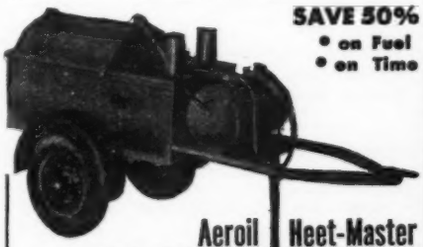

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TWICE AS FAST

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Heavy Duty Machinery Trailers
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BLADES
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Index to Advertisers

A

*Adams Co., J. D.....Second Cover
*Aeroil Burner Co., Inc..... 127
Allis-Chalmers Tractor Division..... 11
Amalie Div., L. Sonneborn Sons, Inc. 70
American Cable Division....Third Cover
American Chain & Cable Co., Inc....
.....Third Cover
Armco Drainage Products Assn.... 6
Anthony Co. 54
Associated Equipment Distributors.. 91
Automatic Equipment Mfg. Co..... 119

B

*Barber Greene Co..... 19
*Bethlehem Steel Co..... 1
Brooks Equipment Mfg. Co..... 117
Bros Boiler & Mfg. Co., Wm..... 30
*Buckeye Tractor Ditcher Co..... 32
Bucyrus-Erie Co. 44
Byers Machine Co., The..... 115

C

C. I. T. Corp..... 115
Calcium Chloride Assn..... 123
Caterpillar Tractor Co..... 27
Ceco Steel Products Corp..... 36
*Cleaver-Brooks Co. 34
Cleveland Rock Drill Co..... 38
Coast Metals, Inc..... 103
Connery Construction Co..... 115
Cummins Engine Co..... 33

D

Davey Compressor Co..... 117
Detroit Diesel Engine Div..... 28

E

*Electric Tamper & Equip. Co..... 112
Embury Mfg. Co..... 128
*Erie Steel Constr. Co..... 42
*Etnyre & Co., E. D..... 113
Euclid Road Machinery Co..... 39

F

Fawick Airflex Co., Inc..... 86
*Flexible Road Joint Machine Co..... 122
Flink Co., The..... 54
Foote Co., Inc., The..... 23
Ford Motor Trucks..... 22
*Four Wheel Drive Auto Co..... 13

G

*Galion Iron Works & Mfg. Co., The 9
*Gar Wood Industries, Inc.....7-40
Gemmer Mfg. Co..... 74
General Motors 28

H

*Hanson Clutch & Machinery Co.... 29
Harnischfeger Corp. 46-117
*Heil Co. 25
*Heltzel Steel Form & Iron Co..... 90
Hercules Roller Co..... 109
Hercules Steel Products Co..... 125
Hetherington & Berner, Inc..... 114
Huber Mfg. Co., The..... 17

I

Insley Mfg. Co..... 116
International Harvester Co..... 24

J

Jackson Vibrators, Inc..... 112
*Jaeger Mach. Co., The.....113-115-117
*Jahn Co., C. R..... 111

K

Koehring Co. 48
Koppers Co., Inc..... 20

L

*La Crosse Trailer & Equipment Co.. 127
*Le Roi Co..... 78
Le Tourneau, Inc., R. G..... 35
Lima Locomotive Works, Inc..... 50
*Link-Belt Speeder Corp..... 52
*Littleford Bros. 76
Lord Baltimore Hotel..... 127
Lowther Co., Harry A..... 121

M

Mack Trucks, Inc..... 105
Maguire Industries, Inc..... 87
Marion Metal Products Co..... 120
Marion Steam Shovel Co., The..... 55
Master Mfg. Co..... 4
McCaffrey, Inc., M. P..... 107
McCarter Iron Works, Inc..... 123
*Michigan Power Shovel Co..... 113
Minnesota Mining & Mfg. Co..... 2
Mir-O-Col Alloy Co..... 14
M R S Mfg. Co..... 72
Municipal Supply Co..... 123

N

Northwest Engineering Co..... 5
Novo Engine Co..... 106

O

Oliver Corp. (Cletrac Div.)..... 37
*Owen Bucket Co., The..... 119

P

Perfection Steel Body Co..... 109
*Pioneer Engineering Works..... 41
Pittsburgh Steel Co..... 31
Preformed Wire Rope..... 8

R

*Reilly Tar & Chem. Corp..... 119
*Riddell Corp., W. A..... 109
Rodgers Hydraulic, Inc..... 101
Rogers Brothers Corporation..... 119
Root Spring Scraper Co..... 127
Rosco Mfg. Co..... 108

S

*Sauerman Bros., Inc..... 124
Schramm, Inc. 21
*Servicised Products Corp..... 51
Shunk Mfg. Co..... 128
Sisalkraft Co. 110
Sonneborn Sons, Inc., L. (Amalie Div.) 70
Standard Oil, Calif..... 53
Standard Oil Co. (Ind.)..... 10
Standard Steel Corp..... 45

T

*Texas Co., The.....56-Back Cover
Thew Shovel Co., The..... 3
Timken Roller Bearing Co..Front Cover
Truscon Steel Co..... 12

U

Union Steel Products Co..... 124
Unit Crane & Shovel Corp..... 119
Universal Atlas Cement Co..... 16
Universal Road Machinery Co..... 122

V

Van der Horst Corp. of America..... 47
Vickers, Inc. 15
Vulcan Tool Mfg. Co..... 122

W

Wallace Tire Service, Inc..... 126
Walter Motor Truck Co..... 49
Ward, La France Truck Division, Great American Industries (Inc.).. 26
Warren-Knight Co. 102
Wellman Engineering Co., The..... 107
W G B Oil Clarifier, Inc..... 102
White Mfg. Co..... 119
Wickwire Spencer Steel Co..... 18
*Wisconsin Motor Corp..... 113
*Wooldridge Mfg. Co..... 43
*Worthington Pump & Machy. Corp.80-81

*Advertisers with * are represented in the 1944 edition of Powers' Road and Street Catalog and Data Book. Please refer to it for additional information on any of their products.

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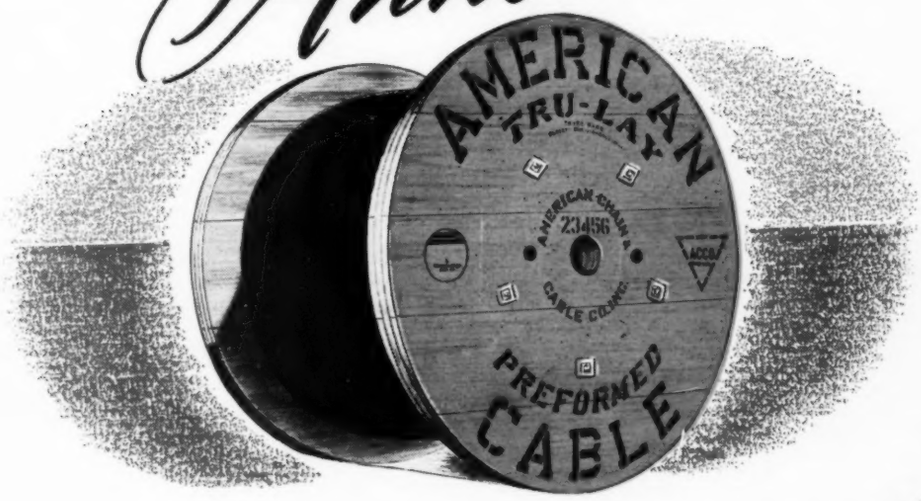

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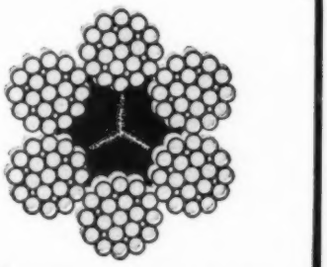

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